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Tanaka, Otohiko

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BIOLOGICAL RESULTS
OF
THE JAPANESE ANTARCTIC RESEARCH EXPEDITION
10.

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BY

OTOHIKO TANAKA

FISHERIES RESEARCH LABORATORY
KYUSHU UNIVERSITY
TSUYAZAKI, NEAR FUKUOKA, JAPAN

SIRAHAMA, WAKAYAMA-KEN
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I. INTRODUCTION

IN the present report I have given an account of the free-swimming Copepoda taken by the Japanese Antarctic Research Expedition. The samples were collected on board the R.S. "Sôya" during her second voyage to the Antarctic in 1957.

The material consists of seventeen gatherings, of which twelve were made by straining the circulatory water of the ship's engine with a plankton net and the remaining five by vertical tow-nettings. The stations, dates of the collection and localities are given in the following table:

TABLE 1. List of stations.

No. of Station	Date	Lat.	Long.	Sea Area	Depth (m)
1	Oct. 29, 1957	14°28'N	115°03'E	South China Sea	Surface
2	Nov. 17,	0°08'S	76°15'E	Indian Ocean	"
3	Nov. 18,	11°00'S	72°29'E	"	"
4	Nov. 19,	13°44'S	68°22'E	"	"
5	Nov. 20,	18°54'S	60°39'E	"	"
6	Nov. 22,	21°19'S	56°43'E	"	"
7	Nov. 25,	27°37'S	47°06'E	"	"
8	Dec. 1,	35°09'S	20°13'E	Off Cape of Good Hope	"
9	Dec. 13,	40°56'S	24°38'E	Sub-antarctic	"
10	Dec. 15,	47°41'S	31°48'E	"	"
11	Dec. 16,	50°50'S	35°27'E	"	"
12	Dec. 17,	54°13'S	39°40'E	"	"
13	Dec. 22,	66°06'S	44°10'E	Antarctic	50-0
14	Dec. 23,	66°51'S	41°19'E	"	200-0
15	Dec. 24,	66°59'S	41°08'E	"	200-0
16	Dec. 25,	67°04'S	40°53'E	"	400-0
17	Dec. 28,	67°03'S	40°44'E	"	250-0

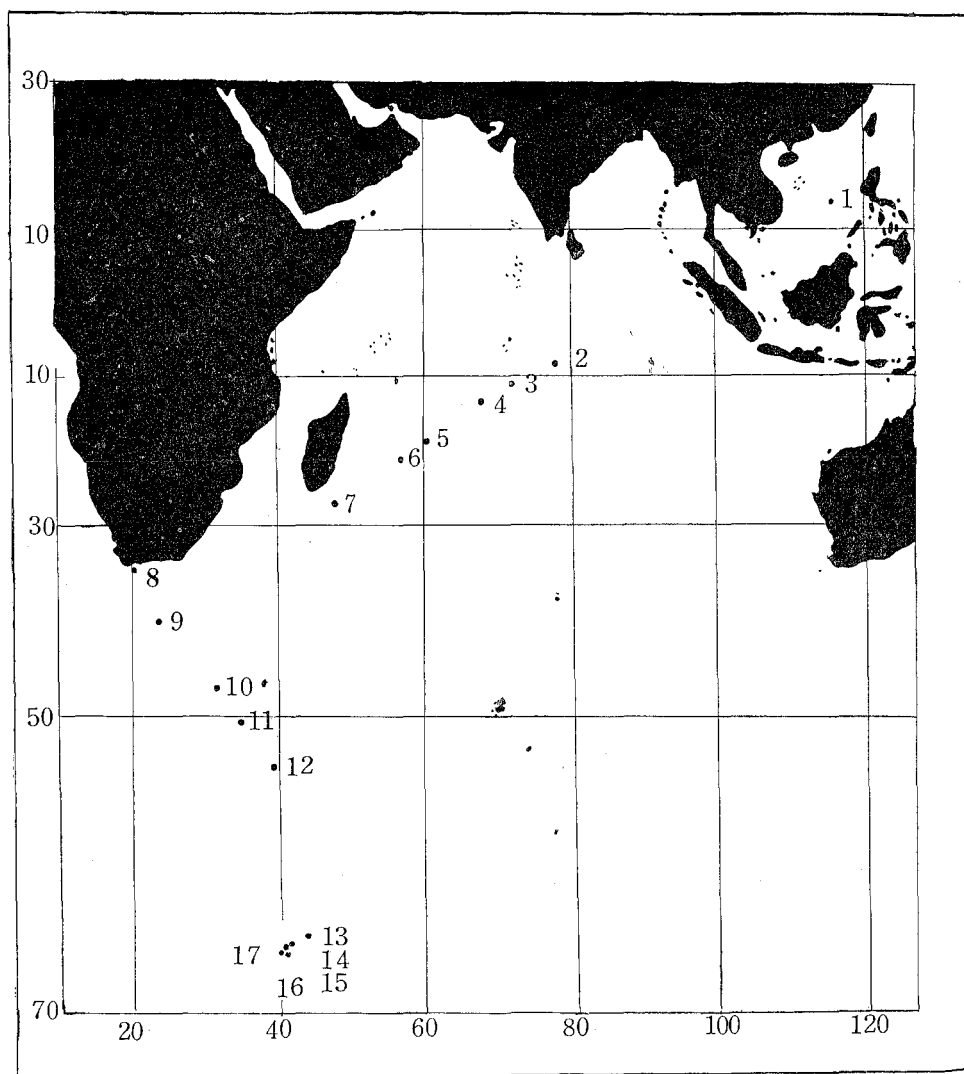


Fig. 1. Chart showing the stations at which Copepoda were taken

Pelagic Copepoda

As is seen from the list given above the gatherings were made in the three main geographical regions: South China Sea, Indian Ocean, and Antarctic Ocean.

The total number of the species found in the material amounts to one hundred. They are fifty-eight species of Calanoida, thirty-seven species of Cyclopoida, and five species of Harpacticoida. The species are inferior in number to the records of the several previous expeditions in the Indian and Antarctic, on account of the fact that the gatherings were chiefly made by straining the surface water except those in the Antarctic. However, the present record will be of use to the knowledge of the fauna in the ocean.

All the specimens here dealt with are kept in the National Science Museum.

II. GENERAL REMARKS ON THE GEOGRAPHICAL DISTRIBUTION

As shown in the list of species the copepods were abundant both in the numbers of species and specimens at Stations 2, 5 and 8 in the Indian Ocean. Station 2 lies in the Equatorial Counter Current, Station 5 in the Indian Central Water, and Station 8 in the Agulhas Current. In the Antarctic a fairly good number of species were observed at Station 15 to 17. Stations 9 to 14 in the Antarctic were represented by only a small number of species, although at Stations 13 and 14 fished vertically. It appears that copepods gradually increase in number towards south in the Antarctic.

In the South China Sea only a single gathering was made. The sample contained sixteen species. With the exception of two species, *Oithona simplex* FARRAN and *Oncaea clevei* FRÜCHTL, the remaining species are all well known from the neighbouring waters of Japan.

The pelagic Copepoda of the Indian Ocean have been studied by many authors: GIESBRECHT, P. T. CLEVE, A. SCOTT, I. C. THOMPSON and A. SCOTT, WOLFENDEN, O. PESTA, SEWELL, GURNEY, FARRAN, and VERVOORT. SEWELL (1912-1932, 1947) recorded 252 species both from the surface and deep waters of the Indian Seas. His list of species contained almost all the species found in the present collection except the pure Antarctic species.

In the Indian Ocean seven gatherings were made. The first three stations are located in the Indian Equatorial Water, and the remainings in the Indian Central Water. Seventy-five species were found, among which three species appear to be new to science. The remaining seventy-two species are entirely consisted of warm water species, and have a wide distribution in the tropical and temperate regions of the three great oceans with the exception of some indigenous species. The present gatherings in the Indian Ocean showed us that these warm water species were distributed as far south as the Sub-tropical

Convergence, and that no warm water species occurred in the south of Station 8 which is located in the south of the Cape of Good Hope.

The Copepoda of the Antarctic have been chiefly studied by GIESBRECHT (1902), WOLFENDEN (1908, 1911), BRADY (1910, 1918), FARRAN (1919), HARDY and GUNTHER (1935), and VERVOORT (1951, 1957). WOLFENDEN has shown that immediately to the north of the New Amsterdam Island the character of the faunal changes, so that there is clearly some boundary in this region across which Indian fauna cannot penetrate. In the north of Kerguelen no Antarctic species appears to extend, while the typically sub-tropical species of the Indian Ocean extend as far south as the latitude 30°S where their southern extension to be arrested. The present record also shows that the pelagic Copepoda have the similar geographical distribution as that stated by WOLFENDEN. There is clearly a boundary between Stations 8 and 9. No warm water species were found in the south of 35°S. Another boundary lies between Stations 12 and 13, across which the Sub-antarctic species cannot penetrate further south and no true Antarctic species extends further north in the surface layer.

In the Antarctic Ocean two regions are distinguished, viz. the Sub-antarctic region and Antarctic region. In the present collection the Sub-antarctic region was represented by the following 10 species :

<i>Calanus simillimus</i> GIESBRECHT	<i>Clausocalanus laticeps</i> FARRAN
<i>Calanus tonsus</i> BRADY	<i>Ctenocalanus vanus</i> GIESBRECHT
<i>Calanoides carinatus</i> (KRÖYER)	<i>Oithona similis</i> CLAUS
<i>Undinula vulgaris</i> (DANA)	<i>Oncaea venusta</i> PHILIPPI
<i>Paracalanus parvus</i> GIESBRECHT	<i>Microsetella rosea</i> DANA

The Sub-antarctic region was thus characterized by a small number of both species and individual, so far as the surface layer is concerned. Among these species *Calanus simillimus*, *C. tonsus*, and *Clausocalanus laticeps* are the true representatives of the Sub-antarctic. *Calanoides carinatus* is widely distributed in the deep waters of the oceans, and the remaining six have also a wide distribution in the surface layer of the oceans.

From the Antarctic region the following twenty-three species were detected :

<i>Calanus propinquus</i> BRADY	* <i>Scaphocalanus brevicornis</i> SARS
<i>Calanoides acutus</i> (GIESBRECHT)	* <i>Scaphocalanus subbrevicornis</i> (WOLFENDEN)
<i>Rhincalanus gigas</i> BRADY	<i>Metridia gerlachei</i> GIESBRECHT
* <i>Ctenocalanus vanus</i> GIESBRECHT	<i>Heterorhabdus farrani</i> BRADY
* <i>Microcalanus pygmaeus</i> (SARS)	<i>Haloptilus ocellatus</i> WOLFENDEN
* <i>Spinocalanus abyssalis</i> GIESBRECHT	<i>Oithona frigida</i> GIESBRECHT
<i>Stephus longipes</i> GIESBRECHT	* <i>Oithona similis</i> CLAUS
<i>Euchirella</i> sp.	* <i>Oncaea conifera</i> GIESBRECHT
<i>Pareuchaeta</i> sp.	<i>Oncaea curvata</i> GIESBRECHT
<i>Scolecithricella glacialis</i> GIESBRECHT	<i>Oncaea notopus</i> GIESBRECHT
<i>Racovitzanus antarcticus</i> GIESBRECHT	* <i>Microsetella rosea</i> DANA
	<i>Tisbe racovitzai</i> (GIESBRECHT)

Pelagic Copepoda

While the first two stations 13 and 14 inclusive were represented by only ten species, the remaining stations taken together had about two times as much species as those of the first two stations. Among these the species marked with asterisk have a wide distribution in the oceans. The remaining fifteen species are the representative of the Antarctic. The occurrence of *Microsetella rosea* at Station 17, seems to be unreasonable. It might have been a dead specimen.

HARDY and GUNTHER have recorded one-hundred species of Copepoda from the waters of the South Georgia Whaling Ground, and discussed the vertical distribution of the important species in the region. In the present collection five vertical hauls were made at Stations 13 to 17 in the Antarctic. But the record shows that it is insufficient to discuss their vertical distribution. From the layer between 50 m to the surface the following seven species were found: *Calanus propinquus*, *Calanoides acutus*, *Ctenocalanus vanus*, *Metridia gerlachei*, *Oithona similis*, *Oncaea curvata*, *Tisbe racovitzai*. The remaining sixteen species taken from the depths below 50 m appear to be usually confined to the intermediate or deep layers in the Antarctic.

III. LIST OF SPECIES TAKEN AT EACH STATION AND INDIVIDUAL NUMBER OF SPECIES

Station	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
<i>Calanus propinquus</i>	—	—	—	—	—	—	—	—	—	—	—	—	2	8	7	2	15	34
<i>Calanus simillimus</i>	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—	—	5
<i>Calanus tonsus</i>	—	—	—	—	—	—	—	—	8	—	—	—	—	—	—	—	—	8
<i>Nannocalanus minor</i>	—	—	—	—	3	—	—	43	—	—	—	—	—	—	—	—	—	46
<i>Calanoides acutus</i>	—	—	—	—	—	—	—	—	—	—	—	—	3	1	18	17	21	60
<i>Calanoides carinatus</i>	—	—	—	—	—	—	—	2	5	—	—	—	—	—	—	—	—	7
<i>Canthocalanus pauper</i>	—	13	—	1	—	—	—	3	—	—	—	—	—	—	—	—	—	17
<i>Undinula darwini</i>	—	2	—	—	1	12	—	—	—	—	—	—	—	—	—	—	—	15
<i>Undinula vulgaris</i>	—	5	7	—	—	4	—	—	—	2	—	—	—	—	—	—	—	18
<i>Eucalanus mucronatus</i>	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
<i>Rhincalanus gigas</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	5	10	18
<i>Paracalanus aculeatus</i>	—	1	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	3
<i>Paracalanus crassirostris</i>	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
<i>Paracalanus denudatus</i>	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Paracalanus nanus</i>	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	2
<i>Paracalanus nudus</i>	—	—	—	—	35	—	—	—	—	—	—	—	—	—	—	—	—	35
<i>Paracalanus parvus</i>	2	2	—	—	—	—	—	161	8	—	—	—	—	—	—	—	—	173
<i>Acrocalanus gracilis</i>	1	72	15	6	5	7	—	5	—	—	—	—	—	—	—	—	—	111
<i>Acrocalanus indicus</i> sp. nov. ...	—	—	—	—	5	—	—	—	—	—	—	—	—	—	—	—	—	5
<i>Calocalanus pavo</i>	—	15	1	2	1	—	—	—	—	—	—	—	—	—	—	—	—	19
<i>Calocalanus plumulosus</i>	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1

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(Continued)

Station	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
<i>Calocalanus styliremis</i>	3	—	—	—	4	—	1	—	—	—	—	—	—	—	—	—	—	8
<i>Clausocalanus arcuicornis</i>	—	16	17	17	24	6	95	13	—	—	—	—	—	—	—	—	—	188
<i>Clausocalanus furcatus</i>	—	6	2	3	6	2	1	27	—	—	—	—	—	—	—	—	—	47
<i>Clausocalanus laticeps</i>	—	—	—	—	—	—	—	—	4	2	—	—	—	—	—	—	—	6
<i>Clausocalanus paululus</i>	—	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	3
<i>Clausocalanus pergens</i>	1	4	—	1	3	1	—	—	—	—	—	—	—	—	—	—	—	10
<i>Ctenocalanus vanus</i>	—	—	—	—	—	—	—	—	—	2	—	3	2	—	31	11	39	88
<i>Microcalanus pygmaeus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	29	4	58	91
<i>Spinocalanus abyssalis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	13	4	17
<i>Stephus longipes</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	3	3
<i>Euchirella</i> sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	5	8
<i>Euchaeta marina</i>	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
<i>Euchaeta wolfendeni</i>	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
<i>Pareuchaeta</i> sp.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	1	7	13
<i>Scolecithrix danae</i>	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
<i>Scolecithricella glacialis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	1	11	9	14	35
<i>Racovitzanus antarcticus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	3	2	7
<i>Scaphocalanus brevicornis</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	2
<i>Scaphocalanus subbrevicornis</i> ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	3
<i>Centropages gracilis</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Centropages typicus</i>	—	—	—	—	—	—	—	125	—	—	—	—	—	—	—	—	—	125
<i>Centropages violaceus</i>	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Pseudodiaptomus nudus</i> sp. nov.	—	—	—	—	—	—	—	12	—	—	—	—	—	—	—	—	—	12
<i>Temora discaudata</i>	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	3
<i>Temora turbinata</i>	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	3
<i>Metridia gerlachei</i>	—	—	—	—	—	—	—	—	—	—	—	—	3	1	16	28	29	77
<i>Pleuromamma abdominalis</i>	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	2
<i>Pleuromamma gracilis</i>	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Pleuromamma piseki</i>	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	4
<i>Lucicutia flavicornis</i>	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Heterorhabdus farrani</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
<i>Haloptilus ocellatus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
<i>Candacia aethiopica</i>	—	—	—	—	2	1	—	—	—	—	—	—	—	—	—	—	—	3
<i>Candacia bipinnata</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Candacia catula</i>	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
<i>Candacia pachydactyla</i>	—	8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8
<i>Acartia negligens</i>	—	2	3	—	8	2	—	4	—	—	—	—	—	—	—	—	—	19
<i>Oithona attenuata</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Oithona fallax</i>	—	2	—	—	1	—	—	1	—	—	—	—	—	—	—	—	1	4
<i>Oithona frigida</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	6	—	39
<i>Oithona nana</i>	6	2	—	—	2	—	—	30	—	—	—	—	—	—	—	—	—	40
<i>Oithona oculata</i>	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1

Pelagic Copepoda

(Continued)

Station	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Total
<i>Oithona plumifera</i>	—	2	—	—	2	—	—	1	—	—	—	—	—	—	—	—	—	5
<i>Oithona similis</i>	—	—	—	—	—	—	—	18	3	33	10	—	14	4	180	5	123	390
<i>Oithona simplex</i>	3	130	2	2	18	1	—	—	—	—	—	—	—	—	—	—	—	156
<i>Oncaea clevei</i>	7	—	—	—	—	—	—	16	—	—	—	—	—	—	—	—	—	23
<i>Oncaea conifera</i>	—	—	—	—	—	—	—	—	—	—	—	—	2	—	48	20	77	147
<i>Oncaea curvata</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	62	6	108	176
<i>Oncaea media</i>	3	14	4	3	5	1	—	240	—	—	—	—	—	—	—	—	—	270
<i>Oncaea notopus</i>	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	1	8	13
<i>Oncaea venusta</i>	1	10	3	—	12	1	—	14	—	1	—	—	—	—	—	—	—	42
<i>Sapphirina angusta</i>	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	3
<i>Sapphirina gemma</i>	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	2
<i>Sapphirina intestinata</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Copilia hendorffi</i>	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	2
<i>Pseudanthessius minimus</i> sp. nov.	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
<i>Corycaeus crassiusculus</i>	—	1	—	2	2	—	—	—	—	—	—	—	—	—	—	—	—	5
<i>Corycaeus speciosus</i>	—	5	—	2	—	1	—	—	—	—	—	—	—	—	—	—	—	8
<i>Corycaeus longistylis</i>	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
<i>Corycaeus andrewsi</i>	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Corycaeus asiaticus</i>	1	4	—	—	1	—	—	28	—	—	—	—	—	—	—	—	—	34
<i>Corycaeus dahli</i>	—	—	—	1	—	—	—	200	—	—	—	—	—	—	—	—	—	201
<i>Corycaeus erythraeus</i>	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	4
<i>Carycaeus subtilis</i>	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	4
<i>Corycaeus agilis</i>	2	80	36	40	17	13	35	79	—	—	—	—	—	—	—	—	—	302
<i>Corycaeus giesbrechti</i>	—	—	—	—	—	—	2	21	—	—	—	—	—	—	—	—	—	23
<i>Corycaeus pacificus</i>	—	1	—	—	—	1	—	3	—	—	—	—	—	—	—	—	—	5
<i>Corycaeus pumilus</i>	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	1
<i>Corycaeus carinatus</i>	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	2
<i>Corycaeus concinnus</i>	2	137	68	200	79	31	52	10	—	—	—	—	—	—	—	—	—	579
<i>Corycaeus curtus</i>	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Corycaeus gibbulus</i>	8	84	9	12	8	—	—	—	—	—	—	—	—	—	—	—	—	121
<i>Corycaeus longicaudis</i>	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
<i>Corycaeus rostratus</i>	—	—	—	—	1	21	50	78	—	—	—	—	—	—	—	—	—	150
<i>Microsetella norvegica</i>	1	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3
<i>Microsetella rosea</i>	4	65	3	3	7	2	1	6	—	1	—	—	—	—	—	—	1	92
<i>Macrosetella gracilis</i>	—	1	—	—	1	26	15	1	—	—	—	—	—	—	—	—	—	44
<i>Euterpina acutifrons</i>	—	—	—	—	—	—	—	17	—	—	—	—	—	—	—	—	—	17
<i>Tisbe racovitzai</i>	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	2
Total number of species at each station	16	37	13	19	35	22	10	37	5	6	1	2	6	6	15	20	21	
Individual number at each station	46	701	170	300	268	137	253	1180	28	41	10	8	27	16	419	138	557	

IV. SYSTEMATIC ACCOUNT

CALANOIDA

Family CALANIDAE

Genus *Calanus* LEACH

1. *Calanus propinquus* BRADY

(Plate I, Figs. 1-8; Plate II, Figs. 1-2)

Calanus propinquus, GIESBRECHT, 1902, p. 16, pl. 1, figs. 1-8; WOLFENDEN, 1911, p. 190; FARRAN, 1929, p. 214; VERVOORT, 1957, p. 26.

Occurrence — Sta. 13, Antarctic Ocean, 50-0 m, 1 female, 1 juv.
 Sta. 14, " 200-0 m, 8 juvs.
 Sta. 15, " 200-0 m, 3 females, 4 juvs.
 Sta. 16, " 400-0 m, 2 juvs.
 Sta. 17, " 250-0 m, 6 females, 9 juvs.

Descriptive Notes — Female. Length, 5.50-5.54 mm. Juvs. 3.00-4.70 mm.

The body robust. The proportional lengths of the cephalothorax and abdomen are as 76 to 24. The head in lateral view lowly arched. The posterior margin of the last thoracic segment produced triangularly reaching the middle of the genital segment. The abdomen 4-segmented. The proportional lengths of the segments and furca are: 32:19::14:11:24=100. The genital segment about as long as wide, produced slightly below. The genital flap squarish. The furcal rami about 2 times as long as wide. The furcal setae are of crimson-red colour.

The 1st antenna 24-jointed, extends to the end of the furca; the total length of the 1st antenna measured 5.45 mm. The lengths of the joints are in the following proportions:

Joint	1	2	3	4	5	6	7	8-9	10	11	12	13	14	15	16	17
	46	70	35	28	31	29	33	51	31	33	38	46	48	48	48	49
	18	19	20	21	22	23	24	25								
	49	54	44	44	39	35	26	46	=1.000.							

The 1st to 4th feet have each 3-jointed exopod and endopod. The outer marginal spine on the 3rd joint of the exopod of the 2nd to 4th feet divides the outer margin in the following proportions which differ slightly from those given by previous authors:

Pelagic Copepoda

	Present record		GIESBRECHT		VERVOORT	
	proximal	distal	proximal	distal	proximal	distal
2nd foot	21	22	12	11	20	17
3rd foot	26	22	5	4	9	7
4th foot	29	20	5	3	5	3

The 3rd joint of the exopod and the terminal spine of the same joint are in the following proportional lengths :

	1st foot	2nd foot	3rd foot	4th foot
3rd joints	23	43	46	48
Terminal spine	45	37	36	37

The 5th pair of feet have 3-jointed exopod and endopod. The 1st basal joint has a rather straight row of teeth on the inner margin. The number of the teeth in the present specimen was 17 (Fig. 8). The 1st joint of the exopod has no seta on the inner distal margin. The outer marginal spine on the 3rd joint of the exopods divides the outer margin in the proportions, 26:15. The 3rd joint of the exopod and the terminal spine of the same joint are in the proportions, 31:32.

Immature specimens in the 5th copepodid stage. Length, 3.94–4.7 mm. The proportional lengths of the cephalothorax and abdomen are about 10:3. The abdomen 4-segmented; the segments and furca are in the proportional lengths: 14:22:17:22:25=100.

The 1st antenna 24-jointed, extends beyond the end of the furca by last 2 or 3 joints. The joints are in the proportional lengths :

Joint	1	2	3	4	5	6	7	8–9	10	11	12	13	14	15	16	17
	48	63	32	24	28	26	28	46	28	32	38	43	45	48	48	50
	18	19	20	20	22	23	24	25								
	52	54	48	48	43	43	34	51	=1.000.							

The 1st to 4th feet have each 3-jointed exopod and endopod.

The 5th pair of feet have 2-jointed exopod and endopod. The 1st basal joint indented on the inner margin. The teeth are 15 in number.

Immature specimens in the 4th copepodid stage. Length, 2.84–3.39 mm. The cephalothorax and abdomen are in the proportional lengths as 21 to 6. The abdomen 3-segmented. The segments and furca are in the proportional lengths: 19:24:31:26=100.

The 1st antenna extends beyond the end of the furca by last 5 or 6 joints. The joints are in the proportional lengths :

Joint	1	2	3	4	5	6	7	8-9	10	11	12	13	14	15	16	17
	51	55	27	22	27	24	27	40	27	27	38	44	49	51	49	49
	18	19	20	21	22	23	24	25								
	51	58	53	49	44	47	38	55	=1.000.							

The 1st to 4th feet have each 2-jointed exopod and endopod. The 5th pair of feet have 1-jointed exopod and endopod. The 1st basal joint is smooth on the inner margin.

Remarks. — An adult female measuring 5.05 mm had an abnormal structure in the 1st antenna. The distal 6 joints were missing. The 19th joint had about 15 long setae on the distal margin of the joint. The setae are of crimson-red colour. A similar example has been reported by STEUER (1910) in *Paracalanus parvus* taken from Quarnero.

Immature specimens of *C. propinquus* are easily confused with the immatures of *Calanus simillimus*. According to FARRAN (1929) the 2nd to 4th larval stages have the abnormally long 1st antenna. VERVOORT (1957) states that a female of *C. simillimus* in the 5th copepodid stage may be easily confused with a female of *C. propinquus* in the copepodid stage IV or III. But the developmental stages of *C. simillimus* are invariably smaller in size than the corresponding stages of *C. propinquus*, and the 1st antennae of the former are shorter. The present immature specimens of *C. propinquus* have the head more vaulted in lateral aspect, which comes near to that of *C. simillimus*.

Distribution. — *Calanus propinquus* is one of the most characteristic species of the Antarctic. According to FARRAN the adult female is most plentiful between 66°30'S and 76°S. North of 66°30'S very few adults were found though the younger stages were abundant on several stations. The most northern point at which an adult female was taken was 54°38'S in the "Terra Nova" Expedition. In the north of the Antarctic Convergence the adult specimens appear to be very few. According to VERVOORT immature specimens increase in the superficial water layer in the localities at or near the Convergence in the BANZARE collection.

2. *Calanus simillimus* GIESBRECHT

(Plate II, Figs. 3-10)

Calanus propinquus, GIESBRECHT, 1892, p. 91, pl. 7, figs. 31, 34, pl. 8, figs. 14, 22, 24, 32; *Calanus simillimus*, GIESBRECHT, 1902, p. 16, pl. 1, figs. 9; FARRAN, 1929, p. 213; VERVOORT, 1957, p. 251.

Occurrence. — Sta. 12, Atarctic, Surface, 4 females, 1 male.

Pelagic Copepoda

Descriptive Notes.—Female. Length, 2.95 mm. The cephalothorax and abdomen are in the proportional length as 76 to 24. The head in lateral view obtusely rounded. The posterior margin of the thoracic segment pointed in dorsal aspect, and reaches the middle of the genital segment. In lateral view the last thoracic segment is triangularly produced into a sharp point.

The abdomen 4-segmented. The segments and furca are in the proportions, 35 : 18 : 14 : 13 : 20 = 100. These proportions agree well with VERVOORT's measurements. The 1st antenna, mouth appendages and swimming feet were considerably mutilated.

In the 5th pair of feet the 1st basal joint has 14 teeth on the inner margin, of which the distal 4 were separated from the rest. The 1st exopodal joint has an inner marginal seta.

Male. Length, 3.18 mm. The cephalothorax and abdomen are in the proportions as 71 to 29. The head more vaulted in lateral view than that of the female. The lateral margin of the last thoracic segment not produced as in the female, but the apex bluntly pointed.

The abdominal segments and furca are in the proportional length :

Segment	Abd. 1	2	3	4	5	Furca
	12	28	17	14	12	17 = 100.

The appendages were considerably damaged. The right 5th foot has the 1st basal joint which is shorter than the left, furnished with 19 teeth on the inner margin. The left foot has 21 teeth on the inner margin.

VERVOORT's (1951) specimens from the station 51°11'S, 11°17'E measured 3.50–3.65 mm in the female, and 3.42 mm in the male. FARRAN's specimens from the station south of 60°S measured 2.8–3.2 mm. The species has, according to VERVOORT, the 1st antenna and furcal setae which are very brittle and easily damaged. He found many specimens which have partly regenerated terminal joints of the same appendage.

Distribution.—This species, though it is a Sub-antarctic copepod of the Atlantic region, is widely distributed in the Antarctic. WOLFENDEN recorded its occurrence from the station 84°01'S, 17°49'E. FARRAN found the form most plentifully between 50° and 60°S. VERVOORT also reports that the species is abundant in the area of the Antarctic Convergence.

3. *Calanus tonsus* BRADY

Calanus tonsus, BRADY, 1883, p. 34, pl. 4, figs. 8, 9; TANAKA, 1956, p. 49, figs. 1–4; VERVOORT, 1957, p. 27, figs. 3–6.

Occurrence.—Sta. 9, Antarctic, Surface, 8 immature females.

Descriptive Notes.—Immature female in the copepodid stage V. Length, 3.39–3.69 mm. The cephalothorax and abdomen are in the proportional lengths as 80 to 20. The abdomen 4-segmented. The segments and furca are in the proportional lengths: 19:29:21:10:21=100. The 1st to 4th swimming feet have each 3-jointed exopod and endopod. The 5th pair of feet have 2-jointed exopod and endopod. The 2nd to 4th feet are each furnished with 4 small spines on the distal border of the 2nd basal joint on the posterior surface just as in the adult. The adult female specimens taken at 48°S, 146°E and sent to me by VERVOORT measured 4.07–4.24 mm.

Remarks.—*Calanus tonsus* BRADY has been confused with *C. plumchrus* MARUKAWA taken from the North Pacific, and reported under the name *C. tonsus*. But on closer examination, the latter is not *C. tonsus* BRADY but is identical with *Calanus plumchrus*. The main structural differences of *plumchrus* are as follows: larger in size; somewhat slender genital segment; reduced teeth on the cutting blade of the mandible; absence of small spines on the distal border of the 2nd basal joint of the 2nd to 5th feet.

Distribution.—The species is a characteristic copepod of the Sub-antarctic epiplankton, and has been recorded chiefly from the north of the Antarctic Convergence. FARRAN recorded the species from 30°–40°S and 50°–60°S. VERVOORT reports that the species is particularly abundant in the New Zealand region and south of Australia.

Genus *Nannocalanus* SARS

4. *Nannocalanus minor* (CLAUS)

Calanus minor, GIESBRECHT, 1892, p. 90, pl. 6, figs. 3, 16, 22, pl. 7, figs. 6, 22, pl. 8, figs. 1, 9, 19, 30.

Occurrence.—Sta. 5, Indian Ocean, Surface, 1 female, 2 immature females.

Sta. 8, " " 40 females, 3 males.

Female. Length, 1.78–2.00 mm.

Male. Length, 1.37–1.40 mm.

Distribution.—The species has a wide distribution in the three great oceans. The geographical range now extends from 33°N in the Atlantic and 35°N in the Pacific to 35°S in the Indian Ocean.

Genus *Calanoides* BRADY

5. *Calanoides acutus* (GIESBRECHT)

(Plate III, Figs. 1–9)

Calanus acutus, GIESBRECHT, 1902, p. 17, pl. 1, figs. 10–14; WOLFENDEN, 1908, p. 10, pl. 1, figs. 9, 10; 1911, p. 192; FARRAN, 1929, p. 216; VERVOORT, 1951, p. 41, figs. 25–33; 1957, p. 29.

Pelagic Copepoda

Occurrence. — Sta. 13, Antarctic, 50–0 m., 3 females.

Sta. 14, " 200–0 m., 1 immature female.

Sta. 15, " 200–0 m., 13 females, 5 immature females.

Sta. 16, " 400–0 m., 13 females, 4 immature females.

Sta. 17, " 250–0 m., 23 females, 8 immature females.

Descriptive Notes. — Female. Length, 4.58–5.28 mm. The cephalothorax and abdomen are in the proportional lengths as 81 to 19. The body slender, soft-skinned and transparent. The head highly vaulted. In some specimen the head slightly carinated at the apex in dorsal aspect. The rostral filaments are long. The lateral margin of the last thoracic segment, when viewed from the side, triangularly produced but narrowly rounded at the distal end which extends about to the middle of the genital segment.

The abdomen 4-segmented. The segments and furca are in the following proportional length: 38:17:12:14:19=100. The genital segment has a lateral swelling on the proximal 1/4 of the segment. The receptacles are small. The genital flap semi-circular in ventral aspect. The ventral surface of the segment produced slightly near the proximal. The small genital flap produced ventrally. The furcal rami about 2 times as long as wide.

The 1st antenna 25-jointed, exceeds the end of the furca by distal 1 or 2 joints. The joints 8 and 9 are separate. The joints are in the following proportional length:

Joint	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	55	47	23	23	27	27	27	33	18	31	35	43	45	51	51	53
	17	18	19	20	21	22	23	24	25							
	53	55	53	49	47	39	35	31	49	=1.000.						

The 1st to 4th feet have each 3-jointed exopod and endopod. The outer marginal spine divides the outer margin of the 3rd joint of the exopod of the 2nd to 4th feet in the following proportions:

	2nd foot	3rd foot	4th foot
Proximal	18	22	22
Distal	12	13	12

The proportional lengths of the 3rd joint and the terminal spine of the exopod of the 2nd to 4th feet as follows:

	2nd foot	3rd foot	4th foot
3rd joint	30	36	35
Terminal spine	26	28	25

The 5th pair of feet have 3-jointed exopod and endopod. The 1st basal joint is smooth on the inner margin. The 2nd basal joint has a small spine at the base of the outer edge spine. The 1st joint of the exopod has no inner distal seta. The outer marginal spine of the 3rd joint of the exopod divides the outer margin in the proportions, 17:9. The 3rd joint of the exopod and the terminal spine of the same joint have the proportional lengths, 12:11. The 3rd joint of the endopod has no outer marginal seta.

Immature females in the copepodid stage V. Length, 3.92–4.75 mm. The cephalothorax and abdomen in the proportional lengths as 81 to 19. The abdomen 4-segmented. The segments and furca are in the proportional lengths: 17:72:15:19:22=100. The immature specimen of this species are easily recognized by the transparent body and long 1st antenna.

Distribution.—The species is one of the common species of the Antarctic. According to VERVOORT the species shows marked decrease in the region of the Antarctic Convergence. In the purely Antarctic localities the adult female is usually taken mixed with the developmental stages. This mode of distribution is shown also in the "Sôya" collection.

6. *Calanoides carinatus* (KRÖYER)

(Plate IV, Figs. 1–9)

Calanus brevicornis, GIESBRECHT, 1892, pp. 90, 98, 127, 726, 728, pl. 6, figs. 7, 9, 18, pl. 7, figs. 10, 11, pl. 8, figs. 5, 28; *Calanus carinatus*, FARRAN, 1929, p. 215; *Calanoides brevicornis*, TANAKA, 1939, p. 251, fig. 1; *Calanoides carinatus*, VERVOORT, 1947, p. 29, figs. 1, 2, 3.

Occurrence.—Sta. 8, Off Cape of Good Hope, Surface, 2 immature females.

Sta. 9, Sub-antarctic, Surface, 2 females, 3 immature females.

Descriptive Notes.—Female. Length, 3.94 mm. The cephalothorax and abdomen are in the proportional lengths as 82 to 18. The cephalothorax elongate. The anterior margin of the head produced, and narrowly rounded at the apex in dorsal view. The head in lateral aspect is slightly crested on the apical portion. The rostral filaments are long and slender. The posterior lateral margin of the thoracic segment narrowly rounded in lateral view, and extends about to the 2/5 of the genital segment.

The abdomen 4-segmented. The proportional lengths of the segments and furca are: 41:16:12:12:19=100. The genital segment slightly wider than long. The genital boss produced slightly below. The receptacles large, extend horizontally, when viewed from the lateral, toward the dorsal. The genital flap semi-circular and small. The furcal rami about 1.6 times as long as wide.

The 1st antenna 25-jointed, and measured about 3 mm in total length. The joints are in the following proportional length:

Pelagic Copepoda

Joint	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	77	60	33	30	33	33	33	27	27	27	30	33	40	44	44	44
	17	18	19	20	21	22	23	24	25							
	47	50	50	44	47	40	37	30	40=1.000.							

The 1st to 4th swimming feet have 3-jointed exopod and endopod. The outer marginal spine on the 3rd joint of the exopod of the 2nd to 4th feet divides the outer margin in the following proportions:

Present record	2nd foot	3rd foot	4th foot
Proximal	27	35	37
Distal	23	26	25

These figures differ slightly from those given by GIESBRECHT:

GIESBRECHT's record	2nd foot	3rd foot	4th foot
Proximal	1	7	5
Distal	1	6	3

The 3rd joint of the exopod of the 2nd to 4th feet and the terminal spine of the same joints are in the following proportions:

	2nd foot	3rd foot	4th foot
3rd joint	50	61	62
Terminal spine	50	53	48

The 2nd basal joint of the 4th foot has a small seta at the base of the outer edge spine. This spine is absent in the 2nd and 3rd feet. The 2nd foot has a long and stout outer edge spine on the 1st and 2nd joints of the exopod. The 1st foot has on the 1st joint of the exopod a small conical process on the posterior surface about the middle of the joint which is clearly seen in lateral aspect.

In the 5th pair of feet the outer marginal spine divides the outer margin of the 3rd joint of the exopod in the proportions, 5:3. The outer margin of the 3rd joint of the endopod has no marginal seta. The 2nd basal joint has a small seta at the base of the outer edge spine.

These adult female specimens are much larger in size than those previously recorded by GIESBRECHT or by FARRAN. GIESBRECHT's female specimens from

the Atlantic and Indian Oceans measured 2.85–2.25 mm. FARRAN's specimens from the Atlantic measured 2.82–2.36 mm, and those from New Zealand 3.6–3.06 mm.

Immature females in the 5th copepodid stage. Length, 1.80–2.14 mm (Sta. 8), 3.17–3.31 (Sta. 9). The specimen measuring 2.14 mm had the proportional lengths of the cephalothorax and abdomen as 80 to 20. The general appearance as in the adult female. The posterior lateral margin of the last thoracic segment rather narrowly rounded at the apical portion.

The abdomen 4-segmented. The segments and furca are in the proportional lengths, 10 : 23 : 14 : 21 : 23 = 100.

The 1st antenna 25-jointed, exceeds the distal end of the furca by last 2 joints.

The 1st to 4th swimming feet have 3-jointed exopod and endopod. The outer marginal spine divides the outer margin of the 3rd joints of the exopod of the 2nd to 4th feet in the following proportions :

	2nd foot	3rd foot	4th foot
Proximal	13	17	20
Distal	13	15	13

These figures agree fairly well with those of the adult female.

The 5th pair of feet have 2-jointed exopod and endopod.

The specimens from the station 9 are larger in size than those from the station 8. But they agree well to minute point of structure with those of the station 8. The specimens from the station 9 are in more advanced stage in the same 5th copepodid.

In the previous paper (TANAKA, 1937) I have recorded the occurrence of *C. brevicornis* from the depth 250–500 m in Suruga Bay. The specimen measured 2.75 mm. Since then 2 more specimens were obtained from the same region. They measured 2.55 mm and 2.74 mm. These specimens have been kept in good condition and were reexamined.

The forehead has a feeble median crest compared with that of the Indian specimens. The postero-lateral margin of the thoracic segment not pointed, but narrowly rounded at the distal end. The proportional lengths of the outer margin of the 3rd joint of the exopod divided by the outer marginal spine are as follow :

	1st foot	2nd foot	3rd foot	4th foot
Proximal	6	10	13	14
Distal	4	10	10	9

Pelagic Copepoda

These figures come near to those given by GIESBRECHT except those of the 3rd foot. The proportional lengths of the 3rd joint and the terminal spine of the 3rd joint of the exopod of the 1st to 5th feet as follows:

	1st foot	2nd foot	3rd foot	4th foot	5th foot
3rd joint	10	19	23	23	13
Terminal spine	20	18	17	17	16

SEWELL (1947, p. 15) has concluded that the specimen of *C. brevicornis* from the Izu region might be an immature of *Calanoides patagoniensis* BRADY, on account of the fact that the specimen has a rounded forehead without any trace of a crest, and the pointed postero-lateral margin of the last thoracic segment. VERVOORT (1947, 1957) is of opinion that the specimen from the Izu region is an immature female in the 5th copepodid stage of *C. carinatus* (KRÖYER). My specimen agree quite well with "Snellius" specimens of *C. carinatus*.

Distribution. — The species has now been widely recorded from the Atlantic, Indian and Pacific Oceans. The adult specimens of this species have been obtained from surface layers, whereas, the immatures predominate in deep waters. The specimens taken in the "Snellius" Expedition, or from the Bay of Biscay (FARRAN, 1926), and Suruga Bay (TANAKA, 1937) were all immature.

Genus *Canthocalanus* A. SCOTT

7. *Canthocalanus pauper* (GIESBRECHT)

Calanus pauper, GIESBRECHT, 1892, p. 91, pl. 6, fig. 4, pl. 8, fig. 25.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female, 2 immature females, 10 males.

Sta. 4, " Surface, 1 female.

Sta. 8, Off Cape of Good Hope, Surface, 1 female, 2 males.

Female. Length, 1.36–1.47 mm.

Male. Length, 1.37–1.40 mm.

Distribution. — The species is widely distributed in the tropical and subtropical regions of the Indian and Pacific Ocean. But it has been recorded only in small number. From the Atlantic Ocean the species has been recorded by WOLFENDEN who states that the species extends as far south as the Cape of Good Hope. The specimens from the neighbouring waters of Japan measured 1.48–1.62 mm in the female, and 1.40 mm in the male.

Genus *Undinula* A. SCOTT

8. *Undinula darwini* (LUBBOCK)

Calanus darwini, GIESBRECHT, 1892, p. 91, pl. 6, fig. 5, pl. 7, fig. 29, pl. 8, figs. 11, 37.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female, 1 immature female.

Sta. 5, " " 1 male.

Sta. 6, " " 7 females, 1 male, 4 juvs.

Female. Length, 2.00–2.26 mm.

Male. Length, 1.95–2.22 mm.

Immature female in the 5th copepodid stage. Length, 1.80 mm.

Immature female in the 4th copepodid stage. Length, 1.49 mm.

Distribution. — The species has a wide distribution in the tropical and temperate waters of the three great oceans. But it is said to be scarcely distributed in the South Atlantic.

9. *Undinula vulgaris* (DANA)

Calanus vulgaris, GIESBRECHT, 1892, p. 92, pl. 6, fig. 11, pl. 7, figs. 2, 24, 27, 28, pl. 8, figs. 13, 17, 35.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female, 4 immature females.

Sta. 3, Indian Ocean, Surface, 2 females, 2 males,
3 immature females.

Sta. 6, Indian Ocean, Surface, 1 male, 3 immature females.

Sta. 8, Off Cape of Good Hope, Surface, 1 female, 1 male.

Descriptive Notes. — There are two size groups in the adult female of this species: forma *major* and forma *minor*. These two forms occurred also in the present collection. The female of forma *major* measured 2.52–2.81 mm, and the male 2.41 mm. Forma *minor* measured 1.86 mm. in the female and 1.84–1.87 mm in the male. According to SEWELL (1929) forma *major* has a thickened posterior thoracic margin terminating in two spines on the left side. Forma *minor* is distinguished from the former by a well-marked backwardly pointing spine on the same thoracic margin. VERVOORT called attention to the fact that there is in the "Snellius" specimens an intermediate form between f. *major* and f. *minor*. The specimen has two spines on the left thoracic margin but the lower spine is slightly developed. I have previously recorded (TANAKA, 1956) *U. vulgaris* from the Izu region. The female specimens measured 2.75–2.81 mm. These specimens are larger in size than those of the Indian Seas reported by SEWELL. Some of the Izu specimens have two spines on the posterior thoracic margin as that of forma *major*, while others have one-pointed spine on the

Pelagic Copepoda

posterior thoracic margin. Thus, we can distinguish two forms according to the shape of the posterior margin of the thoracic segment even in forma *major*.

Distribution. — This surface-living species is widely and abundantly distributed in the tropical and temperate waters of the Atlantic, Indian and Pacific Oceans. It is one of the most common species in Japanese waters.

Family EUCALANIDAE

Genus *Eucalanus* DANA

10. *Eucalanus mucronatus* GIESBRECHT

Eucalanus mucronatus, GIESBRECHT, 1892, p. 132, pl. 9, figs. 9, 26, 34, pl. 25, figs. 15, 35, 38.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 1 immature female.

Descriptive Notes. — Female in the copepodid stage III. Length, 1.84 mm. The cephalothorax, 1.59 mm, abdomen, 0.25 mm. The abdomen including furca 2-segmented. The frontal margin of the head acutely produced but the apex is not so sharply pointed as in the adult female. The mandible has no inner marginal seta on the 2nd basal joint. The endopod 2-jointed. The 2nd joint bears 4 setae, of which the inner marginal one is long.

The 1st to 4th feet have each 1-jointed exopod and endopod.

Remarks. — The present specimen resembles closely *Eucalanus subtenuis* GIESBRECHT in the shape of the forehead. VERTOORT's immature specimens of *E. mucronatus* taken in the "Snellius" Expedition measured 1.75–1.90 mm in the stage III; 1.95–2.20 mm, in the immature female stage IV; 2.30–2.65 mm. in the immature female stage V; and 2.80–3.30 mm in the adult stage. MORI (1937) described *E. mucronatus* from the adjacent waters of Japan but his specimen is not identical with *E. mucronatus* at all. His specimen is a variety of *E. subtenuis* to which FUKASE (1957) has given a name *E. subtenuis* var. *japonica*.

Distribution. — The species is widely but sparingly distributed in the tropical and subtropical regions of the Pacific, Indian and Atlantic Ocean. The southernmost locality hitherto been recorded is 44°05'S, 147°35'E (VERVOORT, 1957).

Genus *Rhincalanus* DANA

11. *Rhincalanus gigas* BRADY

(Plate V, Figs. 1-6)

Rhincalanus gigas, BRADY, 1883, p. 42; 1, 8, figs. 1-11; *Rhincalanus grandis*, GIESBRECHT, 1902, p. 18, pl. 1, figs. 15-18; SCHMAUS, 1927, p. 361, text-figs. 4, 5, 6, 7.

Occurrence. — Sta. 15, Antarctic, 200–0 m. 2 immature males, 1 juv.
 Sta. 16, „ 400–0 m. 1 female, 4 immature females.
 Sta. 17, „ 250–0 m. 2 females, 8 immature females.

Descriptive Notes. — Female. Length, 8.30–8.60 mm. The cephalothorax and abdomen are in the proportional lengths as 86 to 14. The frontal margin of the head produced. The rostral filaments slender and long. The lateral posterior margin of the thoracic segment rounded and slightly emarginate. The 3rd and 4th thoracic segments are furnished with a lateral spine on each side.

The abdomen 3-segmented. The anal segment is fused with the furca. The abdominal segments and furca have the proportional lengths, 46 : 12 : 21 : 21 = 100. The genital segment produced ventrally.

The 5th pair of feet are small and 3-jointed. The distal joint carries 3 apical and a marginal setae.

Immature male in the copepodid stage III measured 3.75–4.05 mm.

Immature male in the copepodid stage IV measured 5.39 mm.

Immature males in the copepodid stage V measured 6.90–7.30 mm. The specimen has the abdomen consists of 4 segments. The 1st abdominal segment has 2 dorsal spines. The 5th pair of feet are just described and figured by SCHMAUS. The endopod of the right foot reduced. In the specimen dissected nerve fibres of the head were clearly observed as shown in the figure (Fig. 2).

Distribution. — This characteristic copepod of the Antarctic is found in all the seas surrounding the Antarctic Continent. Its northern limit is in the Antarctic Convergence. The species is said to have a seasonal vertical migration.

Family PARACALANIDAE

Genus *Paracalanus* BOECK

12. *Paracalanus aculeatus* GIESBRECHT

Paracalanus aculeatus, GIESBRECHT, 1892, p. 164, pl. 9, figs. 20, 26, 30.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female.

Sta. 8, Off Cape of Good Hope, Surface, 2 females.

Descriptive Notes. — Female. Length, 0.78–1.21 mm. The species is easily distinguished from the other members of the genus by the structure of the 5th pair of feet and the hairs on the posterior corner of the last thoracic segment.

SEWELL has reported two forms from the Indian Seas, viz. forma *major* and forma *minor* in the female of this species. SEWELL's forma *major* measured 0.89–0.99 mm, and forma *minor* 0.69 mm. VERVOORT has recorded these two forms which measured 0.90–1.23 mm and 0.80–0.86 mm respectively. FARRAN's specimens from the Atlantic measured 1.08–1.14 mm. The female specimens

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from the Izu region measured 1.18–1.36 mm. The present material contained two forms, of which forma *minor* measured 0.78 mm. The specimen has the abdominal segments and furca in the proportional lengths: 33:14:11:20:22=100. These measurements agree fairly well with those of forma *minor* given by SEWELL.

Distribution. — The species is widely distributed in the tropical and temperate regions of the Indian, Pacific and Atlantic Oceans.

13. *Paracalanus crassirostris* DAHL

(Plate VI, Figs. 1–7)

Paracalanus crassirostris, GIESBRECHT and SCHMEIL, 1898, p. 24; *Paracalanus crassirostris* forma *typica*, FRÜCHTL, 1924, p. 36; GURNEY, 1926, p. 143, fig. 17, A–E; SEWELL, 1929, p. 72, fig. 27, a, b; DEEVEY, 1948, p. 21.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 1 female.

Descriptive Notes. — Female. Length, 0.505 mm. The cephalothorax and abdomen are in the proportional lengths as 76 to 24. The head fused with the 1st thoracic segment. The last two thoracic segments are incompletely separate. The head is both in dorsal and lateral aspects narrowly rounded. The rostrum short and thick without terminal filament. The posterior margin of the thoracic segment evenly rounded.

The abdomen 4-segmented. The segments and furca are in the proportional lengths: 29:12.5:12.5:21:25=100. The genital segment wider than long. The genital area as figured by SEWELL (1929, fig. 27, a). The furcal rami 2.4 times as long as wide.

The 1st antenna 24-jointed, extends about to the distal end of the furca. The joints 1 and 2 are fused. The joints 8 and 9 are separate.

The 1st foot has 3-jointed exopod and 2-jointed endopod. The 1st exopodal joint has a small outer edge spine. The 2nd joint is devoid of outer edge spine. The 3rd joint has 2 spines on the outer margin. The 1st basal joint has no inner marginal seta. The 2nd to 4th feet have 3-jointed exopod and endopod. In the 2nd foot the proximal outer margin of the 3rd joint of the exopod has 5 spinules. The 3rd and 4th feet have each 10 and 9 spinules on the proximal outer margin of the 3rd joint of the exopod. There is no spinules on the distal outer margin of the same joint.

The 5th pair of feet 2-jointed. The distal joint has 2 apical spines of which the inner one is about 2 times as long as the outer marginal.

According to SEWELL species has the 1st antenna extending to the level of the posterior thoracic margin. The joints 1 and 2 are separate but 8 and 9 are fused in the same appendage.

Distribution. — The species has been recorded from the Gulf of Guinea (T. SCOTT), Aru Archipelago (FRÜCHTL), Pearl Banks of Ceylon (THOMPSON and SCOTT), Coast of Southern Burma, the Chilka Lake, Nicobar Island, Andamans (SEWELL), and Suez Canal (GURNEY). It is very interesting that DEEVEY has recorded the species from Tisbury Great Pond, a shallow brackish water pond on the Southern shore of Marthas Vineyard, Massachusetts.

14. *Paracalanus denudatus* SEWELL

Paracalanus denudatus, SEWELL, 1929, p. 66, fig. 23, a-h; FARRAN, 1936, p. 80; TANAKA, 1956, p. 368, fig. 6.

Occurrence. — Sta. 1, South China Sea, Surface, 1 female.

Descriptive Notes. — Female. Length, 0.56 mm. The cephalothorax and abdomen are in the proportional lengths as 76 to 24. The abdominal segments and furca are in the proportional lengths: 30:15:12:21:22=100. The 5th pair of feet 3-jointed.

Remarks. — SEWELL's specimens from the Indian Seas measured 0.64 mm. FARRAN's from the Great Barrier Reef 0.73–0.96 mm. The specimens from Japanese waters 0.73–0.81 mm. The present specimen though much smaller in size than those thitherto been reported agrees quite well with the description and figures given by SEWELL or by FARRAN. The species is closely allied to *P. aculeatus* but can be distinguished from the latter by its small size and by the structure of 5th pair of feet. According to SEWELL a row of leaf-like spines that is present on the posterior surface of the 2nd joint of the exopod of 4th foot in *Paracalanus aculeatus* appears to be always absent in *P. denudatus*. But I have observed this row of spines in the female specimens taken from the Izu region.

Distribution. — The species is widely distributed in the Indian Seas and North-western Pacific Ocean, and also in the northern area of the Arabian Sea.

15. *Paracalanus nanus* SARS

(Plate VII, Figs. 1–11; Plate VIII, Fig. 9)

Paracalanus nanus, SARS, 1925, p. 26, pl. 6, figs. 10–17; SEWELL, 1929, p. 71, fig. 26, a–f.

Occurrence. — Sta. 5, Indian Ocean, Surface, 1 female, 1 male.

Descriptive Notes. — Female. Length, 0.60 mm. The cephalothorax and abdomen are in the proportional lengths as 78 to 22. The head fused with the 1st thoracic segment and so are the 4th with the 5th. The frontal margin of the head narrowly rounded in dorsal aspect but it is obtusely rounded and the

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outline is rather straight at the apical portion in lateral aspect. The posterior thoracic margin is narrowly rounded and the ventro-lateral margin is furnished with short hairs. The rostrum is composed, of two strong and slightly curved spines.

The abdomen 4-segmented. The segments and furca have the proportional lengths: $32:12:14:22:20=100$. The genital segment produced moderately below. The receptacle is long and extends more than half the width of the segment when viewed from the lateral. The genital, 2nd, and 3rd segments are furnished with small spines on the posterior margin. The furcal rami 2 times as long as wide.

The 1st antenna 25-jointed, extends about to the distal margin of the 3rd abdominal segment.

The 1st foot has 3-jointed exopod and 2-jointed endopod. The 1st basal joint has a strong spine near the outer distal corner of the joint. The 2nd basal joint has a longitudinal row of spinules along the outer margin. The 1st joint of the exopod has on the inner margin a lateral swelling which is furnished with stiff hairs. The 2nd to 4th feet have each 3-jointed exopod and endopod. The 2nd foot has 7 spinules on the proximal outer margin and 1 spinule on the distal outer margin of the 3rd joint of the exopod. The 2nd joint of the exopod has a leaf-like spine near the base of the outer edge spine. The 1st joint of the exopod has a row of leaf-like spines. The 3rd foot has 10 spinules on the proximal, and 2 spinules on the distal outer margin of the 3rd joint of the exopod. The 4th foot has 11 spinules on the proximal outer margin of the 3rd joint of the exopod. The leaf-like spines absent on the 2nd joint of the exopod.

The 5th pair of feet 2-jointed and small. The distal joint has 2 spines of which the outer marginal one is very short.

Male. Length, 0.57 mm. The cephalothorax and abdomen have the proportional lengths as 76 to 24. General appearance as in the female. There is a transparent swelling on the mid-dorsal line about the opposite position to the base of the 1st antenna. The ventro-lateral margin of the last thoracic segment has no short hairs.

The abdomen consists of 5 segments and furca having the following proportional lengths: $13:20:15:15:15:22=100$. The 2nd to 4th segments are striated with fine spinules on the distal margin.

The 1st antenna 23-jointed, extends about to the distal margin of the anal segment. The joints 1 and 2, 3 and 4 are fused. The joints are in the following proportional lengths:

Joint	1-2	3-4	5	6	7	8	9	10	11	12	13	14	15	16	17
	80	59	32	48	43	27	38	22	32	38	38	43	43	43	46
	18	19	20	21	22	23	24	25							
	46	48	48	48	54	59	43	32	=1.000.						

The 1st to 4th feet as in the female. The right 5th foot 2-jointed and short. The distal joint has 2 apical spines. The left 5th foot long, extends beyond the end of the furca. The 4th joint terminates into a spine. The 5th joint has 2 apical spines of which the outer marginal one is small.

Immature male in the copepodid stage V. Length, 0.56 mm. The cephalothorax and abdomen are in the proportional lengths as 79 to 21. The abdomen 4-segmented. The segments and furca have the proportional lengths: 14:19:13:31:23=100.

The 2nd to 4th feet have no denticle on the outer margin of the 3rd joint of the exopod. The right 5th foot 2-jointed. The left 5th foot 4-jointed. The terminal joint is long.

Remarks.—The species belongs to *parvus* section. Sars first described the species by the specimen taken near the Azores Island and Madère. The species is easily recognized by its small size, the shape of the posterior thoracic margin, and the 5th pair of feet in the female. The male has not been described, and this is the first record of occurrence.

Distribution.—The species appears to be very sparingly distributed in the temperate areas of the Atlantic, Indian Oceans and Mediterranean Sea.

16. *Paracalanus nudus* SEWELL

(Plate VIII, Figs. 1-9)

Paracalanus nudus, SEWELL, 1929, p. 76, fig. 30, a-i.

Occurrence.—Sta. 5, Indian Ocean, Surface, 35 females.

Descriptive Notes.—Female. Length, 0.52 mm. The cephalothorax and abdomen have the proportional lengths as 77 to 23. The cephalothorax oblong ovate. The head fused with the 1st thoracic segment, and so are the 4th with the 5th. The frontal margin of the head slightly produced at the apical portion both in dorsal and lateral aspects. The rostrum is composed of 2 spines directing postero-ventrally. The posterior thoracic margin narrowly rounded, and is furnished with a tuft of long hairs which direct backwardly.

The abdomen 4-segmented. The segments and furca are in the proportional lengths, 32:12:8:24:24=100. The genital segment wider than long, has the proportion as 19 to 16. The ventral surface of the genital segment produced below. The receptacles small. The lateral surface of the segment is furnished with 2 rows of spinules. The furcal rami long, about 2.7 times as long as broad.

The 1st antenna 25-jointed, extends to the level of the anal segment. The joints have the following proportional lengths:

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Joint	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	93	32	27	27	22	27	27	22	38	27	27	33	38	41	41	41
	17	18	19	20	21	22	23	24	25							
	41	41	44	44	47	55	55	55	55	=1.000.						

These figures agree in the main with those given by SEWELL.

The swimming feet and 5th pair of feet as described and figured by SEWELL. There is no spinule on the outer margin of the 3rd joint of the exopod of 2nd to 4th swimming feet.

Distribution.—The species has been recorded only from the Indian Seas.

17. *Paracalanus parvus* GIESBRECHT

Paracalanus parvus, GIESBRECHT, 1892, p. 164, pl. 1, fig. 5, pl. 6, figs. 28–30, pl. 9, figs. 5, 11, 25, 27, 31, 32.

Occurrence.—Sta. 1, South China Sea, Surface, 1 male, 1 immature male.

Sta. 2, Indian Ocean, Surface, 2 females.

Sta. 8, Off Cape of Good Hope, Surface, 158 females, 3 males.

Sta. 9, Sub-antarctic, Surface, 5 females, 2 males,
1 immature female.

Remarks.—There have been reported two size groups. WOLFENDEN has termed the boreal form as var. *borealis*, and tropical or subtropical form as var. *indicus*, the respective sizes being 1.0–1.1 mm in *borealis* and 0.8–1.0 mm. in *indicus*. SEWELL's specimens from the Indian Seas measured 0.76 mm in the female, and 0.74 mm in the male. FARRAN recorded the species from the tropical and temperate areas of the Atlantic. His specimens measured 0.75–1.02 mm in the female, and 0.82–1.02 mm in the male, and those from the Great Barrier Reef 0.72–0.90 mm in the female. I have previously reported two forms from the Japanese waters. They measured 0.74–0.82 mm in forma *minor*, and 0.92–0.98 mm in forma *major*. These forms differ each other in size, shape of the cephalothorax, and also in the structure of the swimming feet. The present specimens measured 0.85–0.99 mm in forma *major* and 0.69–0.7 mm in forma *minor*, and the male specimens measured 0.76 mm.

Distribution.—The species has a wide distribution in the tropical and temperate areas of the Atlantic, Indian and Pacific, also from the Mediterranean, Black Sea, North Sea, Arabian Sea, and Antarctic.

Genus *Acrocalanus* GIESBRECHT

18. *Acrocalanus gracilis* GIESBRECHT

(Plate IX, Figs. 1–4)

Acrocalanus gracilis, GIESBRECHT, 1892, p. 171, pl. 6, fig. 27, pl. 10, fig. 35.

- Occurrence.* — Sta. 1, South China Sea, Surface, 1 immature female.
 Sta. 2, Indian Ocean, Surface, 72 females.
 Sta. 3, Indian Ocean, Surface, 7 females, 6 immature females,
 2 immature females.
 Sta. 4, Indian Ocean, Surface, 1 female, 3 immature females,
 2 immature males.
 Sta. 5, Indian Ocean. Surface, 4 females, 1 immature female.
 Sta. 6, Indian Ocean, Surface, 4 females, 2 males,
 2 immature females.
 Sta. 8, Off Cape of Good Hope Surface, 5 females.

Female. Length, 1.05–1.34 mm.

Male. Length, 1.19 mm.

Remarks. — FARRAN's specimens from the Great Barrier Reef measured 1.20–1.30 mm in the female. SEWELL's specimens from the Indian Seas measured 1.0 mm in the female, and 0.80–1.00 mm in the male. The specimen from Japanese waters 1.25–1.32 mm in the female and 1.20–1.24 mm in the male.

A female specimen measuring 1.22 mm had an abnormal 5th foot composed of 4 joints on the left side. The distal outer margin of the exopod of the 3rd foot was furnished with very minute spines.

Distribution. — The species has a wide distribution in the tropical and temperate areas of the Atlantic, Indian and Pacific Oceans.

19. *Acrocalanus indicus* sp. nov.

(Plate IX, Figs. 5–9)

Occurrence. — Sta. 5, Indian Ocean, Surface, 5 males.

Descriptive Notes. — Male. Length, 0.43 mm. The cephalothorax and abdomen are in the proportional lengths as 73 to 27. The cephalothorax robust. The anterior margin of the head is broadly rounded in lateral view. The posterior margin of the thoracic segment evenly rounded when viewed from the lateral. The rostral spine small. There is no small swelling on the mid-dorsal line of the head.

The abdomen 5-segmented. The segments and furca are in the proportional lengths: 22:22:13:11:13:19=100. The genital segment 1.6 times as wide as long. The furcal rami about 2 times as long as broad.

The 1st antenna 20-jointed, extends to the level of the genital segment. The joints are in the following proportional lengths:

Joint	1	2	3–4–5	6–7	8	9	10–11–12	13	14	15	16	17	18
	75	30	75	26	26	38	94	42	45	45	45	45	49
	19	20	21	22	23	24	25						
	49	57	56	60	60	38	45=1.000.						

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The joints 10–11–12, and 13 are furnished with short hairs on the posterior margin.

The 1st foot has 3-jointed exopod and 2-jointed endopod. The inner edge seta on the 2nd basal joint was not observed. The 2nd and 3rd joints of the exopod are furnished with small spines on the posterior surface. The 2nd joint of the endopod has 2 inner marginal, 2 apical, and 1 outer marginal setae. The 2nd foot has 3-jointed exopod and endopod. The 2nd and 3rd joints of the exopod have no minute spine on the outer margin. The 3rd joint of the endopod has 6 setae in all.

The right 5th foot absent. The left foot long and 5-jointed. The joints are in the proportional lengths: 32:13:23:20:13=100. The 1st joint is very voluminous. The 4th joint has a small inner distal spine. The 5th joint has 2 apical spines.

Remarks. — The present male specimen differs from the male of *Paracalanus* in having only left foot, in the number of setae on the 3rd joint of the endopod of the 2nd foot, and in the absence of a small swelling on the mid-dorsal line of the head. But absence of spines on the outer margin of the exopod of the 2nd to 4th feet indicates that the specimen come near to *Paracalanus nudus*. SEWELL (1929) called attention to the fact that in both genera *Paracalanus* and *Acrocalanus* there were tendency to the reduction in certain species of the marginal spines on the exopod of the swimming legs.

Distribution. — Central area of the Indian Ocean.

Genus *Calocalanus* GIESBRECHT

20. *Calocalanus pavo* (DANA)

Calocalanus pavo, GIESBRECHT, 1892, p. 175, pl. 1, fig. 13, pl. 4, fig. 15, pl. 9, figs. 3, 4, 13, 19, pl. 35, figs. 43–45.

Occurrence. — Sta. 2, Indian Ocean, Surface, 10 females, 5 immature females.

Sta. 3, Indian Ocean, Surface, 1 female.

Sta. 4, Indian Ocean, Surface, 2 females.

Sta. 5, Indian Ocean, 1 immature female.

Female. Length, 0.79–0.91 mm.

Distribution. — The species has a wide distribution in the tropical and temperate areas of the Atlantic, Indian, and Pacific Oceans, also from the Mediterranean Sea, Arabian Sea, Red Sea, and Celebes Sea.

21. *Calocalanus plumulosus* (CLAUS)

Calocalanus plumulosus, GIESBRECHT, 1892, p. 176, pl. 3, fig. 5, pl. 9, figs. 2, 22, pl. 36, figs. 39–42.

Occurrence. — Sta. 4, Indian Ocean, Surface, 1 female.

Female. Length, 0.92 mm.

Distribution. — Though the species is widely distributed in the tropical and temperate waters of the Atlantic, Indian and Pacific Oceans, and also in the Mediterranean Sea, its occurrence appears to be very sparing.

22. *Calocalanus styliremis* GIESBRECHT

Calocalanus styliremis, GIESBRECHT, 1892, p. 176, pl. 9, figs. 15, 18, 29, pl. 36, figs. 46, 48.

Occurrence. — Sta. 1, South China Sea, Surface, 1 female, 2 immature females.

Sta. 5, Indian Ocean, Surface, 3 females, 1 immature female.

Sta. 7, Indian Ocean, Surface, 1 immature female.

Female. Length, 0.64 mm.

Distribution. — The species is widely but sparingly distributed in the tropical and temperate areas of the Atlantic, Indian, and Pacific Oceans and western Mediterranean Sea.

Family PSEUDOCALANIDAE

Genus *Clausocalanus* GIESBRECHT

23. *Clausocalanus arcuicornis* (DANA)

(Plate X, Figs. 1-9)

Clausocalanus arcuicornis, GIESBRECHT, 1892, p. 186, pl. 1, fig. 14, pl. 2, fig. 7, pl. 10, figs. 3-8, 14, 16, 17, 19, pl. 36, figs. 29-31, 34; SEWELL, 1929, p. 90, fig. 36, 37; FARRAN, 1929, p. 223; FARRAN, 1936, p. 82; VERVOORT, 1946, p. 140; 1957, p. 37; TANAKA, 1956, p. 382, fig. 11, a-d.

Occurrence. — Sta. 2, Indian Ocean, Surface, 7 immature females, 9 immature males.

Sta. 3, Indian Ocean, Surface, 1 female, 3 immature females, 3 immature males, 10 juvs.

Sta. 4, Indian Ocean, Surface, 4 females, 1 male, 12 juvs.

Sta. 5, Indian Ocean, Surface, 10 females, 2 immature females, 2 immature males, 12 juvs.

Sta. 6, Indian Ocean, Surface, 3 females, 1 immature female, 1 immature male.

Sta. 7, Indian Ocean, Surface, 25 females, 70 juvs.

Sta. 8, Cape of Good Hope, Surface, 11 females, 2 males.

Remarks. — Female. Length, 1.12-1.56 mm. Male. Length, 1.12 mm. Several authors have called attention to the great variability in the total length of the female of *Clausocalanus arcuicornis*. These two forms differ in the propor-

tional lengths of the cephalothorax and abdomen, and in the structure of the 5th pair of feet. The present specimens from the Indian Ocean fall into two groups: 1.12–1.30 mm, and 1.26–1.56 mm. The small form has the proportional lengths of the cephalothorax and abdomen as 70 to 30, and those of the large form, 77 to 23. The present large form has the abdomen which is shorter in proportion than that of the small form. FARRAN (1936) states that his specimen from the Great Barrier Reef has in the large form a short abdomen; in this the present large form agrees with FARRAN's. The 5th pair of feet of the small form are indented on the inner margin of the apical spines, whereas, they are smooth in the large form.

The shape of the rostrum is sometimes straight, sometimes curved downwards. The straight rostral spine predominates in the large form, and the curved one in the small form. A specimen measuring 1.30 mm had asymmetrical 5th pair of feet (Fig. 9).

SEWELL's specimens from the Indian Seas measured 0.94 mm and 1.17 mm.

FARRAN's specimens from the Temperate Atlantic, 1.32–1.44 mm, 1.5–1.55 mm.

Tropical Atlantic, 1.1–1.2 mm, 1.45–1.6 mm.

S. temperate Atlantic, 1.38–1.55 mm.

New Zealand, 1.2–1.6 mm, 1.8 mm.

Commonest size, 1.2–1.3 mm, 1.4–1.5 mm.

FARRAN's specimens from the Great Barrier Reef, 1.08–1.28 mm, 1.38–1.62 mm.

VERVOORT's specimens from the Snellius Exped., 0.93–1.23 mm, 1.29–1.50 mm.

TANAKA's specimens from the Izu region, 1.18–1.29 mm, 1.41–1.52 mm.

Distribution. — *Clausocalanus arcuicornis* is one of the species which has the widest range of geographical distribution, extending from the north to the Antarctic region.

24. *Clausocalanus furcatus* (BRADY)

Clausocalanus furcatus, GIESBRECHT, 1892, p. 186, pl. 36, figs. 32, 33, 35.

Occurrence. — Sta. 2, Indian Ocean, Surface, 4 females, 1 immature female, 1 immature male.

Sta. 3, " " , 1 female, 1 male.

Sta. 4, " " , 1 female, 2 immature females.

Sta. 5, " " , 5 females, 1 immature female.

Sta. 6, " " , 1 female, 1 male.

Sta. 7, " " , 1 female.

Sta. 8, Off Cape of Good Hope, surface, 21 females, 6 males.

Descriptive Notes. — Female. Length, 0.96–1.20 mm. Male. Length, 0.76–0.81 mm. The female has the cephalothorax and abdomen in the proportions

as 70 to 30. The abdominal segments and furca have the proportional lengths: 28:22:23:13:14=100. The rostral spine sometimes straight and sometimes slightly curved downwards.

Distribution. — The species has a wide distribution in the tropical and temperate regions of the Atlantic, Indian and Pacific, and recorded also from the Mediterranean, Arabian, and Red Seas.

25. *Clausocalanus laticeps* FARRAN

(Plate XI, Figs. 1-14)

Clausocalanus laticeps, FARRAN, 1929, p. 224, fig. 4; VERVOORT, 1957, p. 38.

Occurrence. — Sta. 9, Antarctic, Suaface, 3 females, 1 male.

Sta. 10, " " " " , 2 immature males.

Descriptive Notes. — Female. Length, 1.62 mm. The cephalothorax and abdomen are in the proportional lengths as 76 to 24. The anterior margin of the head is not so flattened as figured by FARRAN. The rostrum slender and curved downwards.

The abdominal segments and furca are in the proportional lengths: 38:18:16:13:15=100. The genital segment inflated at its shoulders. The receptacles large in ventral aspect. The furcal rami 1.5 times as long as wide, slightly divergent.

The 1st antenna 24-jointed, reaches back to the middle of the last thoracic segment. The joints are in the following proportional lengths:

Joint	1	2	3	4	5	6	7	8-9	10	11	12	13	14	15	16	17
	76	86	36	27	27	27	27	54	27	31	36	45	47	49	49	49
	18	19	20	21	22	23	24	25								
	43	38	40	38	41	45	40	22=1.000.								

The 2nd foot has 6 spines on the distal border of the 2nd basal joint, and they are more slender than those of *Clausocalanus arcuicornis*.

The 5th pair of feet small. The distal joint has 2 spines subequal in length.

Male. Length, 1.07 mm. The dorsal profile of the head rather straight, and has no small transparent swelling. The cephalothorax and abdomen are in the proportions as 70 to 30. The rostral spine absent, and is replaced by a blunt process. The posterior thoracic margin broadly rounded.

The abdomen 5-segmented. The segments and furca are in the proportional lengths: 9:38:19:19:3:12=100.

The 1st antenna 20-jointed extends about to the distal end of the 3rd thoracic segment. The joints 8, 9, 10, joints 15, 16, and joints 24, 25 are fused. The proportional lengths of the joints as follows:

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Joint	1	2	3	4	5	6	7	8-9-10	11	12	13	14	15-16	17
	106	70	35	18	21	21	21	64	21	28	28	35	79	49
	18	19	20-21	22	23	24-25								
	53	53	81	63	70	85	=1.000.							

The swimming feet as those of the female.

The 5th pair of feet as of an usual structure found in the male of *Clausocalanus*. The right foot very small and 2-jointed. The left foot 5-jointed. The distal joint is furnished with a sub-apical spine and distal hairs.

Immature male in the 5th copepodid stage. Length, 1.05 mm. General appearance as in the adult female. The cephalothorax and abdomen in the proportional lengths, 73:27. The abdomen 4-segmented. The lengths of the segments and furca are in the proportions, 18:25:17:23:17=100. The left 5th foot 3-jointed. The right foot 2-jointed.

Distribution.—The species has been recorded by FARRAN from the Antarctic Sector south of New Zealand between 51°47'S and 64°03'S. It has been also recorded from South Georgia and Falkland Whaling Ground by Discovery Survey, and from the south of the Antarctic Convergence by VERVOORT.

26. *Clausocalanus paululus* FARRAN

(Plate XII, Figs. 1-5)

Clausocalanus paululus, FARRAN, 1926, p. 240, pl. 6, figs. 7-12; 1929, p. 224; 1926, p. 82; VERVOORT, 1957, p. 38.

Occurrence.—Sta. 5, Indian Ocean, Surface, 3 females.

Descriptive Notes.—Female. Length, 0.71 mm. The cephalothorax and abdomen are in the proportional lengths as 73 to 27. The head is broadly rounded in lateral view. The posterior margin of the thoracic segment narrowly rounded in dorsal view. The rostral spine slender, curved slightly backwards.

The abdomen 4-segmented. The segments and furca are in the following proportional lengths: 38:20:18:10:14=100. The genital segment slightly produced below. The furcal rami 1.25 times as long as broad.

The 1st antenna broken off in all the specimens.

In the 2nd foot the 2nd basal joint has 5 slender spines on the distal border. The 3rd foot has 4 spines on the distal border of the 2nd basal joint. The 4th foot has no distal spines on the 2nd basal joint.

The 5th pair of feet 3-jointed. The distal joint deeply notched at the apex.

Distribution.—The species has been recorded from the deep waters of the Bay of Biscay, off New Zealand, near Great Barrier Reef, and the south of Tasmania.

27. *Clausocalanus pergens* FARRAN

(Plate XII, Figs. 6-10)

Clausocalanus pergens, FARRAN, 1926, p. 238, pl. 6, figs. 4-6; 1929, p. 224; MORI, 1937, p. 35, pl. 14, figs. 2-8; VERVOORT, 1957, p. 38.

Occurrence. — Sta. 1, South China Sea, Surface, 1 immature female.

Sta. 2, Indian Ocean, Surface, 1 male, 3 immature males.

Sta. 4, " " , 1 male.

Sta. 5, " " , 1 female, 2 males.

Sta. 6, " " , 1 female.

Descriptive Notes. — The female specimens were all mutilated. The form of the rostrum and the structure of the 2nd and 3rd swimming feet distinguish the species from the other members of the genus.

Male. Length, 0.70 mm. The cephalothorax and abdomen are in the proportional lengths as 70 to 30. The abdominal segments and furca are in the proportional lengths: 11:31:22:21:5:10=100.

The 1st antenna 20-jointed. The length of the antenna measured 0.50 mm. The proportional lengths of the joints as follows:

Joint	1	2	3	4	5	6	7	8-9-10	11	12	13	14	15-16	17
	76	66	43	19	24	19	24	57	24	33	24	38	73	47
	18	19	20-21	22	23	24-25								
	57	47	76	57	85	108	=1.000.							

In the 2nd foot the distal margin of the 2nd basal joint is furnished with 8 spines, of which the middle two are small. The 3rd foot has 3 spines on the distal margin of the 2nd basal.

The 5th pair of feet as figured by MORI. The right foot 2-jointed. The distal joint is very small and is furnished with apical hairs. The left foot long. The joints are in the following proportional lengths: 6:28:26:28:12=100.

Remarks. — Male specimens of *Clausocalanus* resemble each other so closely that there arise some difficulties in the identification of them. According to GIBSBRECHT and SCHMEIL the right 5th foot of the male of *C. arcuicornis* is 3-jointed, and that of *furcatus* is not articulated. MORI described and figured a male of *Clausocalanus* which he believed to be the male of *pergens*. His specimen measured 0.9 mm. The right 5th foot 2-jointed. The 2nd foot has 8 spines on the distal border of the 2nd basal joint. The present male specimen is quite identical with MORI's male specimen of *Clausocalanus pergens* in having the similar structure in the 2nd and right 5th feet.

Distribution. — The species has been recorded from the Bay of Biscay, North

Pelagic Copepoda

Temperate Atlantic, Off New Zealand, temperate region of the Japanese waters and South of Tasmania.

28. *Ctenocalanus vanus* GIESBRECHT

Ctenocalanus vanus, GIESBRECHT, 1892, p. 194, pl. 10, figs. 20, 21, 26, pl. 36, figs. 28; BRODSKY, 1950, p. 120; TANAKA, 1956, p. 384; VERVOORT, 1957, p. 37.

Occurrence. — Sta. 10, Antarctic, Surface, 2 immature males.

Sta. 12, " , " , 3 females.

Sta. 13, " , 50–0 m, 2 females.

Sta. 15, " , 200–0 m, 12 females, 2 males, 3 immature females, 1 immature male, 14 juvs.

Sta. 16, " , 400–0 m, 9 females, 2 immature males.

Sta. 17, " , 250–0 m, 19 females, 2 males, 11 immature females, 9 immature males.

Female. Length, 0.97–1.27 mm. Male. Length, 1.10–1.20 mm.

Immature female in the copepodid stage V. Length, 0.96 mm.

Immature male in the copepodid stage V. Length, 1.09–1.20 mm.

Distribution. — The species has a wide distribution in the oceans, and recorded from the tropical regions to the Antarctic.

Genus *Microcalanus* Sars

29. *Microcalanus pygmaeus* (Sars)

(Plate XIII, Figs. 1–9)

Microcalanus pygmaeus, GIESBRECHT, 1902, p. 20, pl. 2, figs. 1–5; WITH, 1915, p. 66; FARRAN, 1929, p. 226; BRODSKY, 1950, p. 115; TANAKA, 1956, p. 385, figs. 12, a–f; VERVOORT, 1957, p. 36.

Occurrence. — Sta. 15, Antarctic, 200–0 m, 17 females, 1 male, 5 immature females, 1 immature male, 5 juvs.

Sta. 16, " , 400–0 m, 3 females, 1 male.

Sta. 17, " , 250–0 m, 35 females, 4 males, 1 immature male, 18 juvs.

Descriptive Notes. — Female. Length, 0.60–0.83 mm. Male. Length, 0.70–0.76 mm. VERVOORT proposed two sub-species: *M. pygmaeus pygmaeus* and *M. pygmaeus pusillus*. The former has the long 1st antenna reaching about the posterior margin of the anal segment, and the latter has shorter antennae. The present specimens belong to the former sub-species in having the long 1st antenna. Two size groups were found among the specimens: the small form measured 0.60–0.74 mm, and the large form measured 0.83 mm respectively. The small form has rather short rostral spines, whereas, the large has long

rostral spines. The terminal spine of the 3rd joint of the exopod of the 2nd foot is rather coarsely dentated (about 40 teeth) in the small form, whereas, it is more finely dentated (about 50) in the latter. The body is transparent in the large form.

Remarks. — FARRAN's specimens from 76°S–78°S measured 0.7–0.88 mm in the female, 0.80 mm. in the male. VERVOORT's specimens from the Antarctic measured 0.70–0.78 mm. in the female. WITH's specimens from the Arctic Seas 0.65–0.90 mm. BRODSKY's specimens from the eastern waters of the U.S.S.R., 0.70–0.88. in the female. TANAKA's specimens from Sagami Bay measured 0.85 mm. in the female.

Distribution. — The species has been recorded from the Arctic as well as from the Antarctic. In the Arctic it appears to be widely distributed. In the temperate and Antarctic regions the species has been recorded from deep waters.

Genus *Spinocalanus* GIESBRECHT

30. *Spinocalanus abyssalis* GIESBRECHT

Spinocalanus abyssalis, GIESBRECHT, 1892, p. 209, pl. 13, figs. 42–48, pl. 36, fig. 49; WITH, 1915, p. 69; FARRAN, 1929, p. 227; JESPERSEN, 1934, p. 51; TANAKA, 1937, p. 253, fig. 4; VERVOORT, 1946, p. 147; 1957, p. 40.

Occurrence. — Sta. 16, Antarctic, 400–0 m, 2 females, 6 immature females, 5 immature males.

Sta. 17, " , 250–0 m, 2 females, 2 immature males.

Descriptive Notes. — Female. Length, 1.10–1.16 mm. There are two size groups in the female of *Spinocalanus abyssalis*. The present specimens belong to the small form. No typical form was found in the collection except 2 immature females measuring 1.53 and 1.56 mm. There is no noticeable structural difference between these two forms. The small form, *Spinocalanus abyssalis* var. *pygmaeus* has a long outer edge spines on the exopod of the 1st foot.

Immature male specimen measuring 1.68 mm had the 1st to 4th swimming feet quite similar in structure to those of the adult female of the typical form. The 5th pair of feet has 2-jointed exopod and 1-jointed endopod. The immature male of small form measured 1.10 and 1.15 mm.

Remarks. — The specimens from the deep water of Suruga Bay measured 1.98 mm in the female, 1.62 mm in the male. These specimens belong to the typical form. FARRAN's specimens of var. *pygmaeus* from the Bay of Biscay measured 0.95–1.08 mm. FARRAN's specimens from the Antarctic waters measured 1.8–2.06 mm with the exception of 2 small specimens which measured 1.18 and 1.20 mm.

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Distribution. — The species have a wide distribution in the deep waters of the oceans, and has been recorded from the Antarctic as far as the Arctic.

Genus *Stephus* TH. SCOTT

31. *Stephus longipes* GIESBRECHT

(Plate XIV, Figs. 1-10)

Stephus longipes, GIESBRECHT, 1902, p. 20, pl. 2, figs. 6-14; FARRAN, 1929, p. 226.

Occurrence. — Sta. 14, Antarctic, 50-0 m, 1 male.

Sta. 17, " , 250-0 m, 2 juvs.

Descriptive Notes. — Male. Length, 0.87 mm. The cephalothorax and abdomen are in the proportional lengths as 71 to 29. The cephalothorax moderately robust. The head separates from the 1st thoracic segment. The last two thoracic segments are fused. The rostrum is represented by a blunt process. The posterior thoracic margin emarginate in lateral view.

The abdomen 5-segmented. The segments and furca have the following proportional lengths: 16:21:17:14:18:14=100. The genital segment swollen laterally in dorsal view. The 3rd and 4th segments have each a small spine on the lateral distal corner of the segment. The furcal rami rounded in shape, and have characteristic setae as shown in the figure.

The 1st antenna 24-jointed, extends when reflexed about to the posterior margin of the 3rd thoracic segment. The joints are in the following proportions:

Joint	1	2	3	4	5	6	7	8-9	10	11	12	13	14	15	16	17
	88	96	44	44	44	44	35	39	26	21	21	26	26	31	31	31
	18	19	20	21	22	23	24	25								
	26	39	44	44	48	52	52	48	=1.000.							

The 1st foot has 3-jointed exopod and 1-jointed endopod. The 1st joint of the exopod has no outer edge spine. The outer edge spine of the 2nd joint of the exopod is small and that on the 3rd joint is long. The 3rd joint of the exopod has 3 inner marginal setae. The endopod has 4 marginal and 1 apical setae. In these characters the genus is intermediate between *Microcalanus* and *Mimocalanus*. The 2nd foot has 3-jointed exopod and 2-jointed endopod, and has a similar structure as in *Microcalanus*. The 2nd joint of the endopod has a long spine on the outer distal margin. The terminal spine of the exopod is finely denticulated. The 3rd and 4th feet have each 3-jointed exopod and endopod.

The 5th pair of feet 5-jointed on each side. They are long and slender.

The left foot has a process furnished with a tubercle on the 2nd joint. The 3rd and 4th joints of both right and left feet very long. The terminal joint of the right foot tapers gradually into a fine point, and the distal half is denticulated. The terminal joint of the left foot is bill-shaped, and looks like a head of a bird.

Immature specimen in the copepodid stage IV. Length, 0.69 and 0.70 mm. The cephalothorax and abdomen are in the proportional lengths are as 76 to 24. The abdomen 3-segmented. The proportional lengths of the segments and furca are as 18:21:41:20=100.

The 1st antenna 24-jointed, extends about to the posterior margin of the 2nd thoracic segment. The 1st to 4th swimming feet have 2-jointed exopod. The endopod of the 1st foot 1-jointed, those of the 2nd to 4th feet 2-jointed. The 5th pair of feet have each 2-jointed basal and a pair of unjointed rami.

Distribution.—The species has been recorded from the region between 69°55'S and 71°02'S by GIESBRECHT. FARRAN found the specimen south of 76°S under the ice. The present specimens were recorded in the similar locality as in the "Gauss" collection.

Family AETIDEIDAE

Genus *Euchirella* GIESBRECHT

32. *Euchirella* sp.

(Plate XV, Figs. 1-5)

Occurrence.—Sta. 15, Antarctic, 200–0 m, 1 immature female.
Sta. 16, " 400–0 m, 2 immature females.
Sta. 17, " 250–0 m, 5 immature females.

Descriptive Notes.—The immature specimens are in the copepodid stage III. They measured 2.74–2.84 mm, and 2.14–2.19 mm. The exopod of the 2nd antenna has long plumose setae reaching the posterior margin of the cephalothorax. The 1st antenna exceeds the distal end of the furca by terminal 3 joints.

Remarks.—There have the following species been recorded from the Antarctic waters: *Euchirella rostromagna* WOLFENDEN, *Euchirella latirostris* FARRAN and *Euchirella hirsta* WOLFENDEN. These species measured 5.52–6.20 mm, 5.4 mm, and 8.5–9.0 mm in the female respectively. The present specimens come near to *E. rostromagna* or *E. latirostris*. But they are too young to be referred to the respective species.

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Family EUCHAETIDAE

Genus *Euchaeta* PHILLIPI

33. *Euchaeta marina* PRESTANDREA

Euchaeta marina, GIESBRECHT, 1892, p. 245, pl. 1, figs. 10-11, pl. 15, figs. 31, 33, pl. 16, figs. 15-17, 22, 23, 25, 29, 30, 41, 46, pl. 37, figs. 30, 37, 38, 49; SEWELL, 1947, p. 113.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female, 1 male.

Female. Length, 3.49 mm.

Distribution. — Tropical and temperate waters of the Atlantic, Mediterranean Sea, Adriatic Sea, Woods Hole region, tropical region of the Indian Ocean, Red Sea, Arabian Sea, tropical and temperate waters of the Pacific, Malay Archipelago, and surrounding waters of Japan.

34. *Euchaeta wolfendeni* A. SCOTT

Euchaeta wolfendeni, A. SCOTT, 1909, p. 68, pl. 17; SEWELL, 1929, p. 153; FARRAN, 1936, p. 91; MORI, 1937, p. 44, pl. 20, figs. 6-11; WILSON, 1950, p. 217.

Occurrence. — Sta. 2, Indian Ocean, Surface, 2 females, 1 male.

Female. Length, 2.53-2.62 mm. Male. Length, 2.39 mm.

Distribution. — Tropical regions of the Indian and Pacific Oceans. Recorded from the Malay Archipelago, Australian Great Barrier Reef, Indian Seas., Arabian Sea, and adjacent waters of Japan.

Genus *Pareuchaeta* A. SCOTT

35. *Pareuchaeta* sp.

(Plate XV, Figs. 6-9)

Occurrence. — Sta. 15, Antarctic, 200-0 m, 1 immature males, 4 juvs.

Sta. 16, " , 400-0 m, 1 juv.

Sta. 17, " , 250-0 m, 7 juvs.

Remarks. — 15 individuals of immature specimens of *Pareuchaeta* were found in the material. The specimens in the copepodid stage III fall into two groups according to their sizes: 2.81-3.04 mm group and 1.94-1.97 mm group.

Several species of *Pareuchaeta* have been reported from the Antarctic: *P. antarctica* (GIESBRECHT), *P. biloba* FARRAN, *P. rasa* FARRAN, *P. erebi* FARRAN, *P. farrani* (WITH), and *P. similis* (WOLFENDEN). These species measured in total lengths:

	Female	Male
<i>Pareuchaeta antarctica</i>	7.47–9.09 mm	6.39–7.07 mm
<i>Pareuchaeta biloba</i>	5.3 –5.9 mm	4.8 –4.9 mm
<i>Pareuchaeta erebi</i>	9.2 –9.5 mm	
<i>Pareuchaeta farrani</i>	11.0 mm	
<i>Pareuchaeta rasa</i>	5.8 –6.0 mm	
<i>Pareuchaeta similis</i>	10.0 mm	

Among those *biloba* and *rasa* come near in size to the present specimens in their adult stage.

An immature male specimen in the copepodid stage IV measured 4.36 mm had the posterior thoracic margin furnished with an acute spine on the lateral distal corner (Fig. 8). The 5th pair of feet have each unjointed exopod and endopod attached to the 2-jointed basal.

Family SCOLECITHRICIDAE

Genus *Scolecithrix* BRADY

36. *Scolecithrix danae* (LUBBOCK)

Scolecithrix danae, GIESBRECHT, 1892, p. 256, pl. 13, figs. 4, 9, 14, 17

Occurrence. — Sta. 6, Indian Ocean, Surface, 1 male.

Male. Length, about 2.32 mm.

Distribution. — North temperate Atlantic, Tropical Atlantic, South temperate Atlantic, Gulf of Guinea, Mediterranean Sea, Woods Hole region, temperate and tropical Pacific, San Diego region, Adjacent seas of Japan, Malay Archipelago, Great Barrier Reef.

Genus *Scolecithricella* SARS

37. *Scolecithricella glacialis* (GIESBRECHT)

(Plate XVI, Figs. 1–8)

Scolecithrix glacialis, GIESBRECHT, 1902, p. 25, pl. 4, figs. 1–7; *Scolecithricella glacialis*, FARRAN, 1929, p. 247; VERVOORT, 1957, p. 101.

Occurrence. — Sta. 14, Antarctic, 50–0 m, 1 female.

Sta. 15, " , 200–0 m, 4 females, 1 immature, female,
6 immature males.

Sta. 16, " , 400–0 m, 3 females, 5 immature females,
1 immature male.

Sta. 17, " , 250–0 m, 7 females, 1 immature female,
6 immature males.

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Descriptive Notes. — Female. Length, 1.28–1.41 mm. The cephalothorax and abdomen are in the proportional lengths as 78 to 22. The abdominal segments and furca are in the proportional lengths: 36:19:19:7:19=100.

The 1st antenna 20-jointed, extends about to the posterior thoracic margin. The joints 3, 4, 5, the joints 8, 9, 10, and the joints 24, 25 are fused. The 1st to 4th swimming feet and 5th pair of feet as shown in the figures (Figs. 3–7).

Immature specimens had the following total lengths:

	Female	Male
Copepodid stage V	1.21–1.12 mm	1.22–1.25 mm
” ” IV	0.89–0.92 mm	0.92 mm
” ” III	0.71 mm	0.67–0.73 mm

The immature male in the copepodid stage V had the 5th pair of feet composed of 2-jointed basal and unjointed exopod and endopod (Fig. 8).

Remarks. — The species is closely allied to *Scolecithricella minor* which has a wide distribution in the temperate and boreal waters of the northern hemisphere, and also in the deep waters of the Antarctic. FARRAN's specimens measured 1.20–1.41 mm, VERVOORT's specimens 1.34–1.46 mm in the female. VERVOORT has described and figured the male of the present species and showed the closer affinity of *S. glacialis* with *S. minor* in the structure of the 5th pair of feet.

Distribution. — Antarctic between 50°S–76°S. In the north of the Antarctic Convergence it is found in the intermediate water, and in the south of the Convergence in the surface water.

Genus *Racovitzanus* GIESBRECHT

38. *Racovitzanus antarcticus* GIESBRECHT

(Plate XVII, Figs. 1–7)

Racovitzanus antarcticus, GIESBRECHT, 1992, p. 26, figs. 8–13, pl. 5, figs. 1–5; FARRAN, 1929, p. 250; VERVOORT, 1957, p. 97.

Occurrence. — Sta. 15, Antarctic, 200–0 m, 1 immature female, 1 immature male.

Sta. 16, ” , 400–0 m, 2 females, 1 immature male.

Sta. 17, ” , 250–0 m, 1 female, 1 immature male.

Descriptive Notes. — Female. Length, 2.37–2.47 mm. The cephalothorax and abdomen are in the proportional lengths as 75 to 25. The frontal margin of the head evenly rounded in dorsal view, and obliquely rounded in lateral view. The rostrum is sausage-shaped. The posterior thoracic margin rounded at the apex in lateral view, but in dorsal view the distal margin is pointed. The line

of fusion between the 4th and 5th thoracic segments is faintly visible from the dorsal.

The abdomen 4-segmented. The segments and furca are in the proportional lengths: $33:14:14:24:15=100$. The genital segment produced below. The receptacles in lateral aspect long and transversally situated in the middle of the genital segment. The furcal rami divergent, with a small appendicular seta on the posterior surface of the ramus. The genital, 2nd, and 3rd segments are striated with fine spinules on the distal margin.

The 1st antenna 22-jointed, extends about to the 2nd thoracic segment. The joints 8, 9 and 10 are fused.

The 1st foot has 3-jointed exopod and unjointed endopod. The 1st exopodal joint has no outer edge spine. The 2nd foot has 3-jointed exopod and 2-jointed endopod. The posterior surface of the 2nd and 3rd joints of the exopod and the 2nd joint of the endopod are furnished with groups of spinules. The 3rd and 4th feet have 3-jointed exopod and endopod.

The 5th pair of feet 2-jointed. The 1st joint short. The 2nd joint moderately long and is furnished with a short apical spine and a long inner marginal seta haired on the distal half of its length.

An immature female specimen in the copepodid stage V measured 1.99 mm. The abdomen 4-segmented. The segments and furca are in the following proportional lengths: $14:16:14:42:14=100$. The 1st to 4th swimming feet and the 5th pair of feet just as those of the adult female.

An immature male in the V-Copepodid stage measured 2.05 mm had the 5th pair of feet which were composed of 2-jointed basals and unjointed exopod and endopod.

Distribution. — The species is one of the characteristic copepoda of the Antarctic, and is distributed over the whole Antarctic area. It occurs sometimes in the north of the Antarctic Convergence. FARRAN recorded a specimen at the surface to the south-west of the South Island, New Zealand.

Genus *Scaphocalanus* Sars

39. *Scaphocalanus brevicornis* (Sars)

(Plate XVIII, Figs. 1-6)

Amalophora brevicornis, Sars, 1902, p. 206, pl. 36; *Scaphocalanus brevicornis*, With, 1915, p. 192, pl. 8, fig. 7, text-fig. 59; FARRAN, 1929, p. 248, fig. 15; *Scaphocalanus minutus*, TANAKA, 1937, p. 262, pl. 13, figs. 1-11; VERVOORT, 1957, p. 107, pl. 97-99.

Occurrence. — Sta. 16, Antarctic, 400-0 m, 1 female.

Sta. 17, Antarctic, 250-0 m, 1 immature male.

Descriptive Notes. — Female. Length, 2.60 mm. The cephalothorax and abdo-

men are in the proportional lengths as 77 to 23. The cephalothorax oblong ovate. The frontal margin of the head narrowly rounded in dorsal view. The basal part of the rostrum thickened. The apex bifurcate with slender filaments. The posterior thoracic margin broadly rounded and slightly emarginate.

The abdomen 4-segmented. The segments and furca are in the proportional lengths: 34:20:19:11:16=100. The genital area not produced below. The genital, 2nd, and 3rd segments are fringed with fine teeth on the distal border. The furcal rami 2 times as long as broad. An appendicular seta arises from the posterior margin of the ramus.

The 1st antenna 23-jointed, extends about to the posterior end of the thoracic segment.

The 1st foot has a small outer edge spine on the 2nd joint of the exopod. The 2nd foot has a fairly long outer edge spine on the 1st joint of the exopod, which exceeds the middle of the outer margin of the next joint. The terminal spine of the exopod of the 2nd foot has 26 teeth along the outer margin.

The 5th pair of feet 2-jointed. The distal joint carries 3 spines, of which the inner proximal is long and serrated along the inner edge. The middle spine is about 1/3 the length of the distal spine.

Remarks. — There has been reported a considerable variability in the structure of the 5th pair of feet of the female of *Scaphocalanus*. VERVOORT (1957) showed an example in which a long spines arose on the middle of the external margin of the distal joint. The present specimen has a similar long spine along the external margin as figured by VERVOORT. Abnormal 5th pair of feet have been described and figured by VERVOORT. Similar examples have been found in the female of *Scaphocalanus affinis* SARS, *S. echinatus* FARRAN and, perhaps, *S. major* (TH. SCOTT) taken from the Izu region, the Pacific Coast of Middle Japan.

I have previously described a male specimen taken from the deep water of Suruga Bay under the name *Scaphocalanus minutus*. The specimen is 2.21 mm. in total length. The male specimen, though smaller in size than those reported by WITH or VERVOORT, may be the male of *S. brevicornis* in having the similar structure in the 5th pair of feet as figured by previous authors, and a curved long outer edge spine on the 1st joint of the exopod of 2nd foot.

Distribution. — The species is widely distributed in the deep waters of the North, and South Atlantic, Pacific Oceans, and Antarctic.

40. *Scaphocalanus subbrevicornis* (WOLFENDEN)

(Plate XIX, Figs. 1-8)

Scaphocalanus subbrevicornis, FARRAN, 1929, p. 249, fig. 16; *Scaphocalanus gracilicauda*, TANAKA, 1937, p. 262, text-fig. 12, a-f; *Scaphocalanus subbrevicornis*, WILSON, 1950, p. 331, pl. 34; VERVOORT, 1951, p. 116; 1957, p. 110.

Occurrence. — Sta. 16, Antarctic, 400–0 m, 2 immature males.

Sta. 17, " , 250–0 m, 1 female.

Descriptive Notes. — Female. Length, 1.69 mm. The cephalothorax and abdomen are in the proportional lengths as 74 to 26. The posterior thoracic margin triangularly produced but the apex obtusely rounded.

The abdominal segments and furca are in the proportional lengths: 34:18:18:11:19=100. The genital segment not swollen below.

The 1st antenna 23-jointed, extends about to the level of the 3rd thoracic segment. The joints 8, 9 and 10 are fused. The joints are in the following proportional lengths:

Joint	1	2	3	4	5	6	7	8–9–10	11	12	13	14	15	16	17
	87	98	47	31	35	31	31	78	20	27	31	39	31	43	39
	18	19	20	21	22	23	24–25								
	43	43	35	43	39	51	78		=1.000.						

In the 2nd antenna the endopod is, as described by WOLFENDEN, slightly longer than the exopod. Their proportional lengths are as 50 to 47.

The 1st foot has 3-jointed exopod and 1-jointed endopod. The 2nd and 3rd joints of the exopod are furnished with groups of small spines on the posterior surface. In the 2nd foot the outer edge spine of the 1st joint of the exopod is shorter than that of the 2nd joint. Their proportional lengths as 7 to 10. They are nearly straight. The 2nd basal joint and the 1st joint of the exopod are furnished, as is stated by WOLFENDEN, with spinules on the posterior surface. These spinules were also observed in the 3rd foot, but not in the 4th foot.

The 5th pair of feet 2-jointed. The distal joint has an apical spine which is $2/3$ the length of the inner marginal spine. The small outer marginal spine was absent in the present specimen.

Immature male specimen in the copepodid stage V. Length, 1.72 mm. The lengths of the cephalothorax and abdomen are 1.28 mm and 0.44 mm respectively. The abdominal segments and furca are in the following proportional lengths: 15:23:19:23:20=100. The 1st to 4th swimming feet as those of the adult female. The 5th pair of feet composed of 2-jointed basal and unjointed exopod and endopod.

Remarks. — *Scaphocalanus subbrevicornis* and *S. longifurca* (GIESBRECHT) resemble each other so closely that FARRAN inclined to regard both species as identical. But VERVOORT is of opinion that both forms are specifically distinct. There has been reported that some differences are found between these two species in the proportional lengths of the exopod and endopod of the 2nd antenna, and the shape of the outer edge spine on the 1st joint of the exopod of the 2nd foot. VERVOORT's specimen of *subbrevicornis* from the Antarctic

has in the 2nd antenna the endopod which is slightly longer than or as long as the exopod. Whereas, Indian specimens have the endopod decidedly shorter than the exopod. I have previously obtained the specimens of both *subbrevicornis* and *longifurca* from the deep water of Sagami Bay. The former measured 1.95–2.06 mm, and the latter 1.48–1.68 mm. In the former the cephalothorax and abdomen have the proportional lengths as 76 to 24. The endopod of the 2nd antenna is about 1.05 times as long as the exopod (50:47). The 2nd foot has a curved outer edge spine on the 1st joint of the exopod. The 5th pair of feet have a rather long terminal spine more than half the length of the inner marginal spine. In *longifurca* the cephalothorax and abdomen are in the proportional lengths as 78 to 22. The 2nd antenna has the endopod which is 1.3 times as long as the exopod (43:33). The 2nd foot has a curved outer edge spine on the 1st joint of the exopod. The terminal spine of the 3rd joint of the exopod in the 2nd foot is more densely dentated than that of *subbrevicornis*. In the 5th pair of feet the joints are broad. The terminal spine about 1/3 the length of the inner marginal spine (17:6).

VERVOORT called attention to the presence of scattered spines on the basal joints of the 2nd to 4th feet of *S. subbrevicornis*. I have observed these small triangular spines on the anterior surface of the 2nd basal joint of the 2nd to 4th feet in the following species: *Scaphocalanus magnus* (TH. SCOTT), *S. affinis* SARS, *S. subbrevicornis* (WOLFENDEN) *S. longifurca* (GIESBRECHT), *S. echinatus* FARRAN and *S. curtus* FARRAN.

I have in 1937 described a male of *Scaphocalanus* under the name *gracilicauda*. The specimen measured 1.75 mm. It has a straight and short outer edge spine on the 1st joint of the exopod of the 2nd foot. The 5th pair of feet much alike the figure of the 5th pair of feet of *S. subbrevicornis* given by VERVOORT (1951, p. 119, fig. 64, c). My male specimen is, without doubt, the male of *subbrevicornis*.

Distribution.—The species has been recorded from the Antarctic by WOLFENDEN, FARRAN, and VERVOORT. WILSON recorded the occurrence of this species from the Philippine Archipelago and Hawaiian Islands in the haul 100—0 fathom. He has not given any account of the species. But the figure of the 5th pair of feet shows that his specimen has an abnormal structure in the feet. VERVOORT is of opinion that WILSON's specimen may probably be a female of *S. longifurca* (GIESBRECHT), and the occurrence of the pure Antarctic species from the North Pacific is doubtful. But it is never unrational that the occurrence of a species which had been deemed to be the characteristic fauna of the Antarctic in the deep waters of the North Pacific. I have in 1937 obtained 3 females of *Scaphocalanus subbrevicornis* from the deep water of Sagami Bay. The limited range of geographical distribution is a result of poor exploration in the Pacific Ocean.

Family CENTROPAGIDAE

Genus *Centropages* KRÖYER

41. *Centropages gracilis* (DANA)

Centropages gracilis, GIESBRECHT, 1892, p. 305, pl. 13, figs. 31, 32, 46, pl. 37, figs. 4, 13; MORI, 1937, p. 62, pl. 31, figs. 1-7; SEWELL, 1947, p. 163.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female.

Female. Length, 2.05 mm.

Distribution. — The species is widely distributed in the tropical and temperate waters of the Pacific, Indian, and Atlantic Oceans. Recorded from the Eastern Pacific (DANA), Western Pacific (GIESBRECHT, MORI), Australian Great Barrier Reef (FARRAN), Malay Archipelago. (A. SCOTT). In the Indian Ocean from the Ceylon Pearl Bank (THOMPSON and A. SCOTT; SEWELL), the Laccadive Sea (SEWELL), the Maldiva and Laccadive Archipelago (WOLFENDEN), the Arabian Sea (SEWELL, THOMPSON and A. SCOTT), the Red Sea (THOMPSON and A. SCOTT). WOLFENDEN recorded the species from the South Atlantic.

42. *Centropages typicus* KRÖYER

(Plate XX, Figs. 1-5)

Centropages typicus, GIESBRECHT, 1892, p. 303, pl. 2, fig. 4, pl. 17, figs. 48, 49, pl. 18, figs. 4, 9, 22, pl. 38, figs. 9, 10; THOMPSON and A. SCOTT, 1903, p. 246; WILSON, 1932, p. 87, fig. 60; 1950, p. 188.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 59 females, 53 males, 13 juvs.

Descriptive Notes. — Female. Length, 1.72–1.82 mm. The cephalothorax and abdomen are in the proportional lengths as 71 to 29. The head has a small process on the mid-dorsal line. The lateral thoracic margin sharply produced and slightly asymmetrical. The abdomen 3-segmented. The genital segment has two spines on the left, one on the dorsal, and one on the ventral. The 2nd segment is produced on the right distal corner. The proximal ventral surface has a large swelling.

In the 5th pair of feet the 2nd joint of the exopod has a long and stout process on the inner distal corner, exceeding the distal end of the 3rd joint of the exopod.

Male. Length, 1.67–1.75 mm. The 2nd joint of the exopod of the right 5th foot rounded and has a long curved spine furnished with denticles along the inner distal margin.

Distribution. — In the Atlantic from Woods Hole region (WILSON), 36°N–62°N

Pelagic Copepoda

(GIESBRECHT). In the Pacific from the stations located off Honshu, Japan.
(WILSON). Mediterranean Sea (THOMPSON and A. SCOTT, GIESBRECHT).

43. *Centropages violaceus* (CLAUS)

Centropages violaceus, GIESBRECHT, 1892, p. 304, pl. 4, fig. 5, pl. 17, figs. 29, 30, 44, pl. 18, figs. 1, 8, pl. 38, figs. 16, 18; MORI, 1937, p. 63, figs. 8-14.

Occurrence. — Sta. 5, Indian Ocean, Surface, 1 immature female.

Descriptive Notes. — Immature female. Length, 1.41 mm. The specimen is slightly before mature. The cephalothorax and abdomen are in the proportional lengths as 69 to 31. The posterior thoracic margin rounded. The abdomen 3-segmented. The proportional lengths of the segments and furca are 28:16:19:37=100. The genital area undeveloped. The furcal rami about 3 times as long as wide.

The 1st antenna very long, exceeds the end of the furca by at least distal 5 joints. The 5th pair of feet have 3-jointed exopod and endopod. The inner distal spine on the 2nd joint of the exopod not fully developed, only reaching the base of the 2nd inner marginal seta on the 3rd joint of the exopod.

Distribution. — The species is distributed in the North and South Temperate Atlantic (FARRAN), the Mediterranean Sea (GIESBRECHT, THOMPSON and A. SCOTT), the Red Sea. (THOMPSON and A. SCOTT). In the Pacific from the Fiji Island (WILSON), and adjacent seas of Japan (MORI).

Family PSEUDODIAPTOMIDAE

Genus *Pseudodiaptomus* HERRICK

44. *Pseudodiaptomus nudus* sp. nov.

(Plate XXI, Figs. 1-9)

Occurrence. — Sta. 8, Off Cape of Good Hope, 3 females, 8 males, 1 immature male.

Descriptive Notes. — Female. Length, 1.31-1.38 mm. The cephalothorax and abdomen are in the proportional lengths as 66 to 34. The head is narrowly rounded in dorsal view, and evenly rounded when viewed from the lateral. The lateral thoracic margin rounded. The rostrum is composed of 2 strong spines reaching the anterior margin of the proximal joint of the 1st antenna.

The abdominal segments and furca are in the proportional lengths: 28:18:22:14:18=100. The genital segment asymmetrical. The right side inflated and left side depressed. The distal lateral corner of the right margin is furnished with a group of small spines. The left side has a low cup-shaped swelling

furnished with 2 long hairs and minute spinules on the distal margin when viewed from the left side. The ventral surface of the segment swollen. The genital boss is furnished with spinules on the periphery, and with 2 whip-like spines on each side of the distal margin. The 2nd and 3rd segments are furnished with coarse teeth on the distal margin. The furcal rami 5.5 times as long as broad.

The 1st antenna 21-jointed, extends about to the level of the posterior margin of the 2nd abdominal segment. The joints are in the following proportional lengths:

Joint	1-2	3-4	5	6	7	8-9	10	11	12	13	14	15	16	17	18
	63	42	27	31	26	47	16	26	31	47	58	63	68	68	68
	19	20	21	22	23	24-25									
	58	52	52	48	52	58	=1.000.								

The 1st to 4th swimming feet are composed of 3-jointed exopod and endopod. The 2nd joint of the exopod of the 1st foot has no outer edge spine. The inner marginal seta of the 2nd basal joint is replaced by a small spine. The 1st basal joint has 2 groups of stiff hairs on the outer margin. The basal joints of the 2nd to 4th feet are furnished with groups of stiff hairs.

The 5th pair of feet 3-jointed. The distal joint has 4 terminal spines, of which the inner distal one is strong and is furnished with a small spine on the inner proximal margin, and fine short hairs on the lateral margins.

Male. Length, 1.18-1.20 mm. The general appearance as in the female. The abdomen 5-segmented. The segments and furca are in the following proportional lengths: 11:20:20:22:11:16=100. The 2nd abdominal segment has hairs on the ventral surface about the middle of the segment. The 2nd, 3rd, and 4th segments are furnished with coarse teeth on the distal margin.

The 1st antenna 21-jointed, measured 0.86 mm in length. The joints are in the following proportional lengths:

Joint	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	70	47	35	18	23	18	23	12	41	23	23	23	18	58	47	64
	17	18-19	20-21	22-23	24-24											
	53	117	123	106	58	=1.000.										

The 5th pair of feet are in the main as those of *Pseudodiaptomus serricaudatus* (T. SCOTT). But the distal joint of the exopod of the left foot is prolonged into a long curved spine, and the outer edge spine on the 1st joint of the exopod of the same foot is so long that it reaches the distal margin of the terminal spine of the 3rd joint.

Immature male in the copepodid stage IV measured 0.78 mm. The abdomen is composed of 3 segments and furcal rami.

Pelagic Copepoda

Remarks. — The present species, though very closely allied to *Pseudodiaptomus serricaudatus* (T. SCOTT), can be separated from it in the female by the following characters: the posterior thoracic margin is spineless; the genital segment is asymmetrical; the outer marginal spine of the distal joint of the 5th foot is slender. In the male the process of the 2nd basal joint of the right foot is more complicated in structure than that of *serricaudatus*; the distal spine of the 3rd joint of the exopod of the left foot is very long; the outer edge spine on the 2nd joint of the exopod of the left foot is also very long.

Diitribution. — Off Cape of Good Hope.

Family TEMORIDAE

Genus *Temora* BAIRD

45. *Temora discaudata* GIESBRECHT

Temora discaudata, GIESBRECHT, 1892, p. 238, pl. 18, figs. 3, 20, 23, pl. 38, figs. 24, 25, 28.

Occurrence. — Sta. 2, Indian Ocean, Surface, 2 females.

Sta. 6, Indian Ocean, Surface, 1 female.

Female. Length, 1.73–1.80 mm.

Distribution. — The species is widely distributed in the tropical and temperate waters of the Pacific and Indian Oceans, and also in the Mediterranean Sea.

46. *Temora turbinata* (DANA)

Temore turbinata, GIESBRECHT, 1892, p. 329, pl. 17, figs. 14, 17, 18, 21, pl. 38, fig. 27.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 2 females, 1 male.

Female. Length, 1.10, 1.22 mm. Male. Length, 1.05 mm.

Distribution. — Widely distributed in the tropical and temperate waters of the Atlantic, Indian, and Pacific Oceans.

Family METRIDIIDAE

Genus *Metridia* BOECK

47. *Metridia gerlachei* GIESBRECHT

(Plate XXII, Figs. 1–8)

Metridia gerlachei, GIESBRECHT, 1902, p. 27, pl. 5, figs. 6–14; FARRAN, 1929, p. 259; VERVOORT, 1957, p. 120.

Occurrence. — Sta. 13, Antarctic, 50–0 m, 2 females, 1 immature male.
 14, „ 200–0 m, 1 female.
 15, „ 200–0 m, 7 females, 1 male, 4 immature females, 4 immature males.
 16, „ 400–0 m, 20 females, 7 immature females, 1 immature male.
 17, „ 250–0 m, 23 females, 5 immature females, 1 immature male.

Descriptive Notes. — Female. Length, 3.46–3.86 mm. The cephalothorax and abdomen are in the proportional lengths as 64 to 36. The thorax gradually attenuates posteriorly. The head separates from the 1st thoracic segment. The 4th and 5th thoracic segments are fused. The postero-lateral margin of the thoracic segment is rounded, and furnished with 2 very small processes closely set together at the distal end. The head in lateral view broadly vaulted along the dorso-lateral line. The rostral spine fine.

The abdomen 3-segmented. The segments and furca are in the proportional lengths: $41:23:15:21=100$.

The 1st antenna 23-jointed, extends about to the level of the posterior margin of the cephalothorax.

In the 2nd foot the 1st joint of the endopod is concave on the inner proximal margin, and is furnished with 2 strong curved spines.

The 5th pair of feet 4-jointed. The distal joint has 3 setae and a small inner marginal spine.

Male. Length, 2.39 mm. The cephalothorax and abdomen are in the proportional lengths as 55 to 45. General appearance as in the female but the head is not so highly vaulted.

The abdomen 5-segmented. The segments and furca are in the proportional lengths: $12:18:16:15:13:21=100$. The clasping antenna on the left side.

The 5th pair of feet 5-jointed on each side. The distal joint of the left foot is long and spoon-shaped with 2 apical and 2 marginal spines. The 3rd joint of the right foot is prolonged into a long curved spine denticulated on the inner distal edge. The 4th and 5th joints of the right foot missing in the present specimen.

Immature female in the copepodid stage IV. Length, 2.53–2.73 mm. The abdomen 3-segmented. The segments and furca are in the proportional lengths: $17:24:22:37=100$. The 5th pair of feet 3-jointed. The distal joint has 4 setae.

Immature female in the copepodid stage V. Length, 2.16–2.39 mm. The abdomen 4-segmented. The segments and furca are in the proportional lengths: $11:20:18:27:24=100$. The 5th pair of feet symmetrical, 4-jointed. The distal joint has 3 outer marginal, 1 apical, and 3 inner marginal spines.

Pelagic Copepoda

Distribution. — The species is one of the characteristic copepod of the Antarctic, and is confined to the inetermediate and deep waters south of the Antarctic Convergence. WILSON (1959) recorded the occurrence of this species from the North Atlantic (8°N–16°N), South Atlantic (23°S–51°S) and East Pacific (West coast of Columbia, Gulf of Panama). But its occurrence in the North Atlantic and Pacific is, as VERVOORT pointed out, very doubtful.

Genus *Pleuromamma* GIESBRECHT

48. *Pleuromamma abdominalis* (LUBBOCK)

Pleuromamma abdominale, GIESBRECHT, 1892, p. 347, pl. 5, fig. 8, pl. 32, figs. 3, 5, 13, 22, 25–30, pl. 33, figs. 43, 44, 48, 49, 52; *Pleuromamma abdominalis*, STEUER, 1932, p. 9, figs. 21–25.

Occurrence. — Sta. 5, Indian Ocean, Surface, 1 female.

Sta. 6, " " " " , 1 female.

Female. Length, 3.10 mm. The specimen belongs to forma *typica* STEUER.

Distribution. — The species is a warm water form, and widely distributed in the Atlantic, Indian, and Pacific Oceans. The specimen is found from the surface to the great depth.

49. *Pleuromamma gracilis* (CLAUS)

Pleuromamma gracilis f. *minima*, STEUER, 1923, p. 33, figs. 125, 126; *Pleuromamma gracilis*, FARRAN, 1929, p. 260, figs. 23, 24.

Occurrence. — Sta. 5, Indian Ocean, Surface, 1 female.

Female. Length, 1.75 mm.

Remarks. — The anal segment has divergent lateral margins. *P. gracilis* from Suruga Bay measured 1.72 mm in the female. FARRAN's specimens from the North Temperate Atlantic measured 1.85 mm, and those from Auckland and Campbell Island 2.28–2.4 mm.

Distribution. — The species is widely distributed in the tropical and temperate waters of the Atlantic, Indian and Pacific Oceana. The geographical distribution of the species has been discussed in details by. STEUER.

50. *Pleuromamma piseki* FARRAN

Pleuromamma piseki, FARRAN, 1929, p. 260, figs. 23, 24; *Pleuromamma gracilis* f. *piseki*, STEUER, 1923, p. 34, figs. 128–133; TANAKA, 1937, p. 267, figs. 16, a, b; VERVOORT, 1957, p. 124.

Occurrence. — 5, Indian Ocean, Surface, 4 females.

Female. Length, 1.85–1.90 mm.

Remarks. — My previous specimen from Suruga Bay measured 1.86 mm. The anal segment of the female has parallel lateral margins. The body larger and stouter than in *gracilis*. FARRAN's specimen from the temperate and tropical Atlantic measured 1.95–2.00 mm.

Distribution. — In the Pacific from New Zealand, Great Barrier Reef of Australia, Phillipine Archipelago, Suruga Bay, Formosa, Hawaii Island, Galapagos Island.

Family LUCICUTIIDAE

Genus *Lucicutia* GIESBRECHT

51. *Lucicutia flavicornis* (CLAUS)

Lucicutia flavicorni, GIESBRECHT, 1892, p. 358, pl. 5, fig. 4, pl. 19, figs. 2, 3, 15–17, 21, 23, 29, 38, pl. 38, figs. 38, 40.

Occurrence. — Sta. 5, Indian Ocean, Surface, 1 male.

Male. Length, 1.36 mm.

Remarks. — FARRAN's specimens from the temperate and tropical Atlantic measured 1.4–1.5 mm in the female, and occasional large female 1.96 mm. His specimens from the Great Barrier Reef measured in the small size 1.3–1.4 mm and 1.63–1.80 mm in large size. The specimens from the Japanese waters measured 1.46–1.64 mm in the female, and 1.34–1.70 mm in the male.

Distribution. — The species is widely distributed in the temperate and tropical waters of the oceans.

Family HETERORHABDIDAE

Genus *Heterorhabdus* GIESBRECHT

(Plate XXIII, Figs. 1–6)

52. *Heterorhabdus farrani* BRADY

Heterorhabdus farrani, VERVOORT, 1951, p. 128, figs. 70–77; 1957, p. 134, fig. 126.

Occurrence. — Sta. 16, Antarctic, 400–0 m, 1 male.

Descriptive Notes. — Male. Length, 3.80 mm. The cephalothorax and abdomen are in the proportional lengths as 68 to 32. The cephalothorax oval in dorsal view. The frontal organ slightly produced, to which 2 slender rostral filaments are attached. The head in lateral view has a distinct constriction opposite to the oral part. The postero-lateral thoracic margin rounded in lateral view, and in dorsal view it is obtusely pointed.

The abdominal segment 5—segmented. The segments and furca are in the proportional lengths: 19:16:15:13:6+31=100. The right furcal ramus has the 2nd and 3rd internal setae furnished, beside usual fine hairs, with small spines along each side of the setae (Fig. 1).

The left 1st antenna is transformed into a clasping organ. The mouth parts as described and figured by VERVOORT (1951).

The 5th pair of feet are similar in structure to those figured by VERVOORT (1957, fig. 126). The right foot has a big conical swelling on the inner margin of the 2nd basal. The 2nd joint of the exopod is voluminous, and has an internal tubercle which is more complicated in shape than that figured by VERVOORT. The 3rd joint of the exopod rather small, and has a short apical spine. The inner surface of the joint is furnished with rows of granules and a short spine. In the left foot the 2nd basal joint is smooth on the inner margin. The 1st joint of the exopod is sinuous on the inner margin. The 2nd joint of the exopod has a strong outer edge spine. The 3rd joint of the exopod has a spine on the inner distal corner. The inner margin of the joint has a long slightly curved spine furnished with to rows of denticles toward the distal end.

Remarks.—FARRAN (1929) remarks in his description of *H. robustus* that *Alloiorhabdus austrinus* WOLFENDEN is identical with his *robustus*. BRADY has described and figured a form, *H. farrani* from the Antarctic in 1918. VERVOORT (1951) recorded both sexes of a species of *Heterorhabdus* from the Antarctic, which he thought that they were identical with WOLFENDEN's from. VERVOORT, after studying BRADY's figure and slide of the 5th feet of the male, has concluded that BRADY's *farrani* may perhaps be identical with WOLFENDEN's from, and furthermore with his specimens taken in the William Barendsz Expedition. VERVOORT opposed to FARRAN's opinion that *robustus* and *Alloiorhabdus austrinus* are identical. I have previously obtained several specimens of *robustus* both female and male from the Izu region. On comparing the present male with that of *robustus* I am convinced that *farrani* is clearly distinct from *robustus* so far as the male is concerned. They differ each other in the shape of the 5th pair of feet. The 3rd joint of the right 5th foot of *farrani* is different in the proportional length from that of *robustus*, and also in the characteristic long spine on the inner margin of the 3rd joint of the exopod of the left foot. The present male specimen comes nearest to that of *farrani* described and figured by VERVOORT.

Several immature specimens of *Heterorhabdus* were found in the material. They were in the copepedid stage III and measured 0.77–1.15 mm. These specimen were composed of two species, of which the robust one appears to be the immature of *H. farrani*.

Distribution.—The species appears to be the characteristic fauna of the Antarctic, and has been recorded exclusively from the south of the Antarctic

Convergence. *H. robustus* FARRAN appears to have a wide distribution in the deep water of the oceans, and has been recorded from the Irish West Coast by FARRAN, from Canary and Azores by SARS, and from Japanese water by TANAKA.

Family AUGAPTILIDAE

Genus *Haloptilus* GIESBRECHT

53. *Haloptilus ocellatus* WOLFENDEN

(Plate XXIV, Figs. 1-5)

Haloptilus ocellatus, WOLFENDEN, 1908, p. 42, pl. 3, figs. 1, 2; WOLFENDEN, 1911, p. 324; FARRAN, 1929, p. 268; VERVOORT, 1957, p. 138.

Occurrence. — Sta. 17, Antarctic, 250–0 m, 1 female.

Female. Length, about 7.90 mm. The specimen was considerably mutilated. The characteristic black eye spot on the back was not observed in the specimen. The body was soft-skinned and hyaline.

Distribution. — South of 60°S and occasionally found in the north of 60°S.

Family CANDACIIDAE

Genus *Candacia* DANA

54. *Candacia aethiopica* (DANA)

Candace aethiopica, GIESBRECHT, 1892, p. 424, pl. 4, fig. 13, pl. 21, figs. 1, 9, pl. 22, figs. 1, 6, 13, 14, 32, 40, pl. 29, figs. 7, 11, 13; *Candacia aethiopica*, GIESBRECHT und SCHMEIL, 1898, p. 128.

Occurrence. — Sta. 5, Indian Ocean, Surface, 1 male, 1 immature male.
Sta. 6, " " " " , 1 juv.

Male. Length, 1.96 mm. Immature male in the V-copepedid stage, 1.64 mm.

Remarks. — The specimens is slightly smaller in size than those hitherto been recorded. The female specimen from the Japanese waters measured 2.15–2.8 mm in the female and 2.0–2.43 mm in the male.

Distribution. — The species is widely distributed in the tropical and temperate regions of the great oceans. Also in the Mediterranean Sea, Arabian Sea, Malay Archipelago, Great Barrier Reef of Australia, Coast of Burma, the Bay of Bengal, adjacent seas of Japan, San Diego region.

55. *Candacia bipinnata* (GIESBRECHT)

Candace bipinnata, GIESBRECHT, 1892, p. 424, pl. 22, fig. 20, pl. 39, figs. 27, 29.

Pelagic Copepoda

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female.

Female. Length, 2.42 mm.

Distribution. — Widely distributed in the tropical and temperate waters of the oceans, Mediterranean Sea, Arabian Sea, adjacent seas of Japan, and North-eastern Pacific.

56. *Candacia catula* (GIESBRECHT)

Candace catula, GIESBRECHT, 1892, p. 425, pl. 22, figs. 3, 27, 28.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 immature female, 1 immature male.

Immature female in the copepodid stage V. Length, 1.52 mm.

Immature male in the copepodid stage V. Length, 1.14 mm. The immature male has a long left 5th foot composed of 3 joints. The right foot has an undeveloped endopod and unjointed exopod.

Distribution. — Pacific Ocean, Red Sea, Malay Archipelago, Sagami Bay, Tokara Island, Coast of Formosa, East China Sea, Kii Channel, Off Kinkwa-san, Indian Seas, Great Barrier Reef of Australia, Maldive and Laccadive Archipelago.

57. *Candacia pachydactyla* (DANA)

Candace pachydactyla, GIESBRECHT, 1892, p. 424, pl. 21, fig. 17, pl. 22, figs. 11, 19, pl. 39, figs. 30–33.

Occurrence. — Sta. 2, Indian Ocean, Surface, 2 males, 6 immature males.

Male. Length, 12.67–2.74 mm. Immature males in the copepodid stage V. Length, 1.25–1.64 mm.

Distribution. — Tropical Atlantic, South Atlantic, North Atlantic, Indian Seas, Malay Archipelago, Maldive and Laccadive Archipelagoes, Arabian Sea, South China Sea, Phillipine Island and Fiji Island, Sagami Bay, Kii Channel, and Hachijo Island.

Family ACARTIIDAE

Genus *Acartia* DANA

58. *Acartia negligens* DANA

(Plate XXIV, Fig. 6)

Acartia negligens, GIESBRECHT, 1892, p. 508, pl. 30, fig. 22, pl. 43, fig. 18.

Occurrence — Sta. 2, Indian Ocean, Surface, 1 female, 1 immature male.

Sta. 3, " , " , 3 immature females.

Sta. 5, Indian Ocean, Surface, 4 females, 2 males,
2 immature males.

Sta. 6, " , " , 1 female, 1 immature female.

Sta. 8, " , " , 3 females, 1 immature female.

Descriptive Notes. — Female. Length, 1.06–1.27 mm. The cephalothorax and abdomen are in the proportional lengths as 75 to 25. The rostral filament absent. The postero-lateral margin of the thoracic segment broadly rounded and slightly sinuate, and has 2 small spines and short hairs on the distal margin. In the 5th foot the terminal claw is furnished with small denticles. The outer marginal seta is very long, more than 5 times as long as the distal joint. Male. Length, 1.03–1.05 mm.

Remarks. — FARRAN's specimens from the Great Barrier Reef measured 1.70–2.07 mm. The specimens from the Izu region, 1.09–1.20 mm. Those from the Temperate Atlantic 1.1–1.2 mm.

Distribution. — Pacific Ocean, 27°N–26°S (GIESBRECHT), Malay Archipelago (A. SCOTT), Fiji Island (WILSON), Sagami Bay (TANAKA), Tokara Island, Eastern Coast of Formosa, East China Sea, Kii Channel, Hachijo Island, (MORI), Great Barrier Reef (FARRAN), Indian Seas (SEWELL), Red Sea (GIESBRECHT), Western Mediterranean (GIESBRECHT), Tropical and North Temperate Atlantic (FARRAN).

CYCLOPOIDA

Section GNATHOSTOMA

Family OITHONIDAE

Genus *Oithona* BAIRD

(Plate XXIV, Figs. 7–12)

Oithona attenuata, FARRAN, 1913, p. 187, pl. 30, figs. 3–9; ROSENDORN, 1917, p. 42, text-fig. 25, a–h; FRÜCHTL, 1924, p. 70; SEWELL, 1947, p. 70.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female.

Descriptive Notes. — Female. Length, 0.80 mm. The anterior and posterior regions of the body are in the proportional lengths as 52 to 48. The rostrum absent.

The posterior region of the body has the segments and furca in the proportional lengths:

Segment.	Th. 5	Abd. 1–2	3	4	5	Furca
	12	29	15	14	13	17 = 100.

Pelagic Copepoda

The 1st to 4th swimming feet have each the following number of outer marginal spine and inner marginal setae on the 1st to 3rd joints of the exopod :

	Outer marginal spine			Inner marginal seta		
	Re 1	Re 2	Re 3	Re 1	Re 2	Re 3
1st foot	1	1	3	1	1	4
2nd foot	1	1	3	1	1	5
3rd foot	1	1	3	1	1	5
4th foot	1	1	2	1	1	5

The 1st joint of the exopod of the 1st foot has a short seta on the inner margin. This seta is, according to FARRAN, absent in his specimen examined. In other respects the specimen agrees well with FARRAN's description and figures.

Remarks. — FRÜCHTL called attention to the presence of a seta on the 1st joint of the exopod, and an inner marginal seta on the 1st basal joint of the 1st swimming foot. FRÜCHTL's specimen from the Aru Archipelago measured 0.738 mm. FARRAN's specimen from the Great Barrier Reef 1.78 mm. But this figure appears to be erroneous. The size may, perhaps, be 0.78 mm.

Distribution. — The species is sparingly distributed in the tropical region of the Pacific, Indian and Atlantic Oceans. Recorded from Pago Pago Harbour, Samoa (ROSENDORN), Great Barrier Reef (FARRAN), Christmas Island (FARRAN), Nicobar Island (SEWELL), Maldive Archipelago, Arabian Sea (ROSENDORN), Cape of Good Hope (ROSENDORN).

60. *Oithona fallax* FARRAN

(Plate XXV, Figs. 1-7)

Oithona fallax, FARRAN, 1913, p. 185, pl. 27, figs. 9-12, pl. 28, figs. 1-3; ROSENDORN, 1917, p. 27, text-figs. 14, a, b, 15, a-h; FRÜCHTL, 1924, p. 66; MORI, 1937, p. 112, pl. 62, figs. 13-18; SEWELL, 1947, p. 253.

Occurrence. — Sta. 2, Indian Ocean, Surface, 2 immature females.

Sta. 5, Indian Ocean, Surface, 1 male.

Sta. 8, Off Cape of Good Hope, 1 immature female.

Descriptive Notes. — Male. Length, 0.66 mm. The proportional lengths of the anterior and posterior regions of the body are as 62 to 38. The rostrum not visible from the dorsal. It is represented by a blunt process when viewed from the lateral.

The posterior region of the body has the segments and furca in the proportional lengths :

Segment	Th 5	Abd. 1	2	3	4	5	Furca
	19	21	16	13	10	11	10 =100.

The 1st antenna 13-jointed. The knee-joint occurs between the joints 11 and 12.

The 1st to 4th swimming feet have each the following number of outer marginal spine and inner marginal setae on the joints of the exopod:

	Outer marginal spine			Inner marginal seta		
	Re 1	Re 2	Re 3	Re 1	Re 2	Re 3
1st foot	1	1	2	0	1	4
2nd foot	1	0	2	1	1	5
3rd foot	1	0	2	1	1	5
4th foot	0	0	2	1	1	5

Remarks. — ROSENDORN's male specimen of *O. fallax* has the following number of outer marginal spine on the joints of the exopod: 1st foot, 1, 1, 2; 2nd foot, 1, 1, 3; 3rd foot, 1, 1, 2; 4th foot, 1, 1, 2. The present male agrees fairly well with that described by ROSENDORN except the number of outer marginal spines on the 2nd to 4th feet. The present specimen resembles also closely *O. similis* CLAUS. But the male of *similis* has the outer marginal spines of the exopod of the swimming feet quite different in number from those of the present specimen.

Distribution. — Tropical and temperate regions of the Atlantic, Indian Ocean, Arabian Sea, Christmas Island, Aru Archipelago, Agulhas Current Strait of Formosa, Kii Channel.

61. *Oithona frigida* GIESBRECHT

(Plate XXV, Figs. 8-10)

Oithona frigida, GIESBRECHT, 1902, p. 29, pl. 6, figs. 10-16; FARRAN, 1929, p. 283; VERVOORT, 1957, p. 145.

Occurrence. — Sta. 15, Antarctic, 200-0 m, 1 female, 1 immature female.

Sta. 16, " , 400-0 m, 6 females.

Sta. 17, " , 250-0 m, 17 females, 14 juvs.

Descriptive Notes. — Female. Length, 1.19-1.35 mm. The anterior and posterior regions of the body have the proportional lengths as 54 to 46. The posterior region of the body has the segments and furca in the following proportional lengths:

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	9	32	15	16	13	15 =100.

Pelagic Copepoda

The 1st antenna 13-jointed, extends to the middle of the genital segment.

The 1st to 4th feet have each the following number of outer marginal spine and inner marginal seta on the joints of the exopod:

	Outer marginal spine			Inner marginal seta		
	Re 1	Re 2	Re 3	Re 1	Re 2	Re 3
1st foot	1	1	3	1	1	4
2nd foot	1	1	3	0	1	5
3rd foot	1	0	1	0	1	5
4th foot	0	0	1	0	1	5

The outer marginal spine on the 3rd joint of the exopod of the 4th foot is 1.3 times as long as the joints of the exopod taken together. The 1st basal joint of the 4th foot is furnished with hairs on the proximal outer margin.

Remarks. — The carmin-red colour remained around the oral parts and in the cephalothorax.

Distribution. — Ross Sea (WOLFENDEN, FARRAN), Pacific Sector of the Antarctic (GIESBRECHT), Atlantic Sector of the Antarctic (VERVOORT), Indian Sector of the Antarctic (VERVOORT, and present record), South Georgia region (HARDY and GUNTHER), Off Tasmania and Macquarie (BRADY, VERVOORT).

62. *Oithona nana* GIESBRECHT

(Plate XXVI, Figs. 1-4)

Oithona nana, GIESBRECHT, 1892, p. 538, pl. 4, fig. 8, pl. 34, figs. 10, 11, 20, 24, 26, 34, 35, 42, pl. 44, figs. 2, 4, 6; ROSENDORN, 1917, p. 40, figs. 24, a-d; MORI, 1937, p. 113, pl. 63, figs. 1-8; SEWELL, 1947, p. 254.

Occurrence. — Sta. 1, Indian Ocean, Surface, 2 females, 4 immature females.

Sta. 2, " , " , 2 females.

Sta. 5, " , " , 1 female, 1 immature female.

Sta. 8, " , " , 28 females, 2 males.

Descriptive Notes. — Female. Length, 0.51–0.64 mm. The anterior and posterior regions of the body are in the proportional lengths as 52 to 48. The rostrum absent. The posterior region has the segments and furca in the proportional lengths:

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	12	32	17	15	11	13 = 100.

The furcal rami 2 times as long as wide. The genital segment produced laterally about on the proximal 1/5 of the segment.

The 1st to 4th feet has the following number of seta on the joints of the exopod :

	Re 1	Re 2	Re 3
1st foot	1	1	3
2nd foot	1	1	3
3rd foot	1	1	3
4th foot	1	1	2

The terminal spine of the exopod of the 1st to 4th feet are longer than the 3rd joint of the exopod of the respective foot.

Male. Length, 0.55 mm. The anterior and posterior regions of the body have the proportional lengths as 54 to 46. The posterior region has the segments and furca in the following proportional lengths :

Segment	Th. 5	Abd. 1	2	3	4	5	Furca
	13	21	17	16	13	10	10 =100.

Remarks. — According to GURNEY (1927) there are two forms in this species, a northern smaller form measuring 0.53–0.55., and a southern larger form measuring 0.62–0.69 mm. FRÜCHTL's specimens from the Aru Archipelago measured 0.50–0.63 mm. SEWELL's from the Arabian Sea, 0.56 mm. The specimens from the Japanese waters measured 0.62 mm in the female, and 0.54 mm in the male.

Distribution. — The species has a wide distribution in the oceans. Also in the Mediterranean Sea, Red Sea, Arabian Sea, Gulf of Suez, and in the temperate regions of the Japanese waters.

63. *Oithona oculata* FARRAN

(Plate XXVI, Figs. 5–10)

Oithona oculata, FARRAN, 1913, p. 188, pl. 30, figs. 8, 9, pl. 31, figs. 2–9; ROSENDORN, 1917, p. 37, text-fig. 23, a–g; SEWELL, 1947, p. 254.

Occurrence. — Sta. 8, Cape of Good Hope, Surface, 1 female.

Descriptive Notes. — Female. Length, 0.89 mm. The anterior and posterior regions of the body have the proportional lengths as 58 to 32. The rostrum not visible from the dorsal, and is represented by a blunt process. The last thoracic segment has on each side a small spine on the postero-lateral margin. The posterior region has the segments and furca in the proportional lengths :

Segment	Th. 5	Abd. 1–2	3	4	5	Furca
	13	29	15	16	12	15 =100.

Pelagic Copepoda

The furcal rami slightly divergent, about 2.7 times as long as broad.

The 1st to 4th feet have each the following number of outer marginal spines and inner marginal setae on the joints of the exopod:

	Outer marginal spine			Inner marginal seta		
	Re 1	Re 2	Re 3	Re 1	Re 2	Re 3
1st foot	1	1	3	1	1	4
2nd foot	1	1	3	1	1	5
3rd foot	1	1	3	1	1	5
4th foot	1	1	2	1	1	5

The inner and outer marginal setae on the joints of the endopod are as follows:

	Inner marginal seta			Outer marginal seta		
	Ri 1	Ri 2	Ri 3	Ri 1	Ri 2	Ri 3
1st foot	1	1	4	0	0	1
2nd foot	1	2	4	0	0	1
3rd foot	1	2	4	0	0	1
4th foot	1	2	3	0	0	1

In the 1st foot the terminal spine of the exopod is longer than the 3rd joint of the exopod (23:19), and has 19 teeth along the outer margin. The spine is slightly notched near the inner distal end (Fig. 9).

Distribution.—The species has been recorded from the tropical waters of the Pacific (ROSENDORN) and Indian Oceans.

64. *Oithona plumifera* BAIRD

(Plate XXVI, Figs. 11-13)

Oithona plumifera, GIESBRECHT, 1892, p. 537, pl. 4, fig. 10, pl. 34, figs. 12, 13, 22, 25, 27-29, 32, 33, pl. 44, figs. 1, 7, 12-15; ROSENDORN, 1917, p. 10, text-fig. 1, a-d; MORI, 1937, p. 109, pl. 60, figs. 3-5; SEWELL, 1947, p. 255.

Occurrence.—Sta. 2, Indian Ocean, Surface, 2 immature females.

Sta. 5, " , " , 1 female, 1 immature female.

Sta. 8, " , " , 1 immature female.

Descriptive Notes.—Female. Length, 1.13 mm. The anterior and posterior regions of the body have the proportional lengths as 51 to 49. The genital segment has a patch of hairs on the proximal ventral surface.

Immature female. Length, 0.96 mm. The anterior and posterior regions of the body have the proportional lengths as 53 to 47. The posterior region of the body has the segments and furca in the proportional lengths:

Segment	Th. 5	Abd. 1	2	3	4	Furca	
	13	15	17	15	26	14	=100.

The 1st antenna 11-jointed, extends about to the 3rd abdominal segment. The joints are in the following proportional lengths:

Joint	1	2	3	4	5	6	7	8	9	10	11
	161	45	71	103	136	136	39	180	39	45	45=1.000.

The 1st to 4th feet have each the following number of outer marginal spines on the joints of the exopod:

	Re 1	Re 2	Re 3
1st foot	1	1	2
2nd foot	11	0	2
3rd foot	1	0	1
4th foot	0	0	1

Distribution. — The species has wide distribution in the temperate and tropical regions of the three great oceans. The species appears to be tolerant of brackish or even of fresh waters. I have observed a female specimen taken from a fresh water well in Okino Erabu Shima, Amami Islands, Japan. The specimen measured 1.13 mm, agrees quite well with the description of *O. plumifera* BAIRD.

65. *Oithona similis* CLAUS

(Plate XXVI, Figs. 1-9)

Oithona similis, GIESBRECHT, 1892, p. 541, pl. 34, figs. 18, 19, 21, 36-39, pl. 44, figs. 3, 5, 8, 11; ROSENDORN, 1917, p. 24, fig. 13, a-e; MORI, 1937, p. 112, pl. 62, figs. 1-12; VERVOORT, 1957, p. 146.

Occurrence. — Sta. 8, Cape of Good Hope, Surface, 15 females, 3 males, 14 immature females.

Sta. 9, Antarctic, Surface, 3 females, many juvs.

Sta. 16, " , " , 33 females, many juvs.

Sta. 11, " , " , 10 females, 33 juvs,

Sta. 13, " , 50-0 m, 13 females, 1 male,

4 immature females.

Pelagic Copepoda

Sta. 14, Antarctic, 200–0 m, 4 females, 1 immature female.

Sta. 15, " , 200–0 m, 161 females, 19 males, many juvs.

Sta. 16, " , 400–0 m, 4 females, 1 male,
1 immature female.

Sta. 17, " , 250–0 m., 109 females, 14 males, many juvs.

Descriptive Notes.—Female. Length, 0.71–1.05 mm. The anterior and posterior regions of the body have the proportional lengths as 55 to 45. The rostrum curved slightly posteriorly, not visible from the dorsal. The segments of the posterior region are in the proportional lengths :

Segment	Th. 5	Abd. 1–2	3	4	5	Furca
	10		36	15	15	14 10 =100.

The 1st antenna 12–jointed, extends about to the middle of the genital segment. The joints are in the following proportional lengths :

Joint	1	2	3–4	5	6	7	8	9	10	11	12	13–14
	6	7	6	5	4	14	27	5	12	2	5	7 =100.

The 1st to 4th feet have each the following number of the outer marginal spine and inner marginal seta on the joints of the exopod :

	Outer marginal spine			Inner marginal seta		
	Re 1	Re 2	Re 3	Re 1	Re 2	Re 3
1st foot	1	1	2	0	1	4
2nd foot	1	0	1	0	1	5
3rd foot	1	0	1	0	1	5
4th foot	0	0	1	0	1	5

The inner and outer marginal setae on the joints of the endopod are as follows :

	Inner marginal seta			Outer marginal seta		
	Ri 1	Ri 2	Ri 3	Ri 1	Ri 2	Ri 3
1st foot	1	1	4	0	0	1
2nd foot	1	2	4	0	0	1
3rd foot	1	2	4	0	0	1
4th foot	1	2	3	0	0	1

Male. Length, 0.75–0.82 mm. The anterior and posterior regions of the body have the proportional lengths as 63 to 37. The posterior region of the body has the segments in the proportional lengths :

Segment	Th. 5	Abd. 1	2	3	4	5	Furca
	12	26	18	12	9	11	12 =100.

The 1st antenna has the knee-joint between the joints 11 and 12. The 1st to 4th feet have each the following number of outer marginal spine on the joints of the exopod :

	Re 1	Re 2	Re 3
1st foot	1	1	2
2nd foot	1	1	2
3rd foot	1	1	2
4th foot	1	1	2

Remarks. — The female varied in size from 0.71 to 1.05 mm. No difference was found among them in general appearance and also in the structure of the appendages. FARRAN (1929) reported that some of the Antarctic specimens had a rather broad and flattened cephalothorax, but their swimming feet and other appendages agreed well with the typical type. FARRAN's specimens from the tropical Atlantic and Antarctic measured 0.76–1.08 mm. ROSENDORN's typical type measured 0.78 mm.

Distribution. — The species is widely distributed in every region of the oceans.

66. *Oithona simplex* FARRAN

(Plate XXVIII, Figs. 1–6)

Oithona simplex, FARRAN, 1913, p. 187, pl. 29, figs. 10–14, pl. 30, figs. 1, 2; ROSENDORN, 1917, p. 44, text-fig. 26, a–f; FRÜCHTL, 1924, p. 73.

Occurrence. — Sta. 1, South China Sea, Surface, 3 females.

Sta. 2, Indian Ocean, Surface, 61 females, 46 males, 23 juvs.

Sta. 3, " , " , 1 female, 1 male.

Sta. 4, " , " , 1 female, 1 male.

Sta. 5, " , " , 14 females, 3 males,

1 immature female.

Sta. 6, " , " , 1 immature female.

Descriptive Notes. — Female. Length, 0.30–0.44 mm. The anterior and posterior regions of the body have the proportional lengths as 65 to 35. The rostrum absent. The body robust, wider than half the length of the anterior region of the body. The posterior region of the body has the segments and furca in the proportional lengths :

Pelagic Copepoda

Segment Th. 5 Abd. 1-2 3 4 5 Furca
 12 35 15 15 8 15 =100.

The furcal rami divergent, twice as long as broad.

The 1st antenna short, extends to the level of the posterior end of the 2nd thoracic segment. The joints are in the following proportional lengths:

Joint 1 2 3 4 5-6 7 8 9 10-11 12 13-14
 12 6 13 5 12 6 8 5 13 51 5 =100.

The 1st to 4th feet have each the following number of outer marginal spines and inner marginal setae on the joints of the exopod:

	Outer marginal spine			Inner marginal seta		
	Re 1	Re 2	Re 3	Re 1	Re 2	Re 3
1st foot	1	1	3	0	1	4
2nd foot	1	1	3	1	1	5
3rd foot	1	1	3	1	1	5
4th foot	1	1	3	1	1	5

The inner and outer marginal setae on the joints of the endopod are as follows:

	Inner marginal seta			Outer marginal seta		
	Ri 1	Ri 2	Ri 3	Ri 1	Ri 2	Ri 3
1st foot	1	1	4	0	0	1
2nd foot	1	2	4	0	0	1
3rd foot	1	2	4	0	0	1
4th foot	1	2	3	0	0	1

Male. Length, 0.375-0.43 mm. The anterior and posterior regions of the body have the proportional lengths as 64 to 44. The general appearance as in the female. The posterior region of the body has the segments and furca in the following proportional lengths:

Segment Th. 5 Abd. 1 2 3 4 5 Furca
 16 22 17 15 15 5 10 =100.

The 1st antenna has the knee-joint between the joints 11 and 12.

Distribution. — The species is distributed in the Indo-Pacific. FARRAN recorded the species from Christmas Island. FRÜCHTL from the Aru Archipelago. According to FRÜCHTL the species was rare in the stations located in the open sea.

Section POECILOSTOMA

Family ONCAEIDAE

Genus *Oncaea* PHILIPPI

67. *Oncaea clevei* FRÜCHTL

(Plate XXVIII, Figs. 7-13)

Oncaea clevei, FRÜCHTL, 1924, p. 89, figs. 62-70; SEWELL, 1947, p. 258.

Occurrence. — Sta. 1, South China Sea, Surface, 2 females, 1 male, 2 immature females, 2 immature males.

Sta. 8, Cape of Good Hope, Surface, 1 female, 15 males.

Descriptive Notes. — Female. Length, 0.68–0.76 mm. The proportional lengths of the anterior and posterior regions of the body are as 65 to 35. The 2nd thoracic segment has a median dorsal process. The proportional lengths of the segments of the posterior region are as follows:

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	10	50	6	6	10	18 = 100.

Male. Length, 0.46 mm. The proportional lengths of the anterior and posterior regions of the body are as 65 to 35. There is no median process on the dorsal of the 2nd thoracic segment. The proportional lengths of the segments of the posterior region are as follows:

Segment	Th. 5	Abd. 1	2	3	4	5	Furca
	12	62	5	2	3	7	9 = 100.

The genital segment $\frac{2}{3}$ as wide as long. The furcal rami 1.5 times as long as broad.

Remarks. — SEWELL's specimen from the Arabian Sea measured 0.68 mm. FRÜCHTL's from the Aru Archipelago, 0.68 mm. FARRAN's from the Great Barrier Reef, 0.63–0.68 mm. in the female, 0.53–0.55 mm. in the male.

Distribution. — Recorded from Aru Archipelago, Great Barrier Reef, Malay Archipelago Arabian Sea, South China Sea (present record), Cape of Good Hope (present record).

68. *Oncaea conifera* GIESBRECHT

(Plate XXIX, Figs. 1-8)

Oncaea conifera, GIESBRECHT, 1892, p. 591, pl. 2, fig. 10, pl. 47, figs. 4, 16, 21, 28, 34, 38, 42, 55, 56; FARRAN, 1929, p. 285; 1936, p. 127; MORI, 1937, p. 120, pl. 66, figs. 10-13.

Pelagic Copepoda

Occurrence. — Sta. 13, Antarctic, 50–0 m, 2 males.

Sta. 15, " , 200–0 m, 6 females, 20 males,
22 immature females.

Sta. 16, " , 400–0 m, 13 females, 5 males,
2 immature females.

Sta. 17, " , 250–0 m, 13 females, 39 males,
25 immature females.

Descriptive Notes. — Female. Length, 1.17–1.27 mm. The cephalothorax and abdomen are in the proportional lengths as 66 to 34. The 2nd thoracic segment has a well-marked dorsal projection. The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1–2	3	4	5	Furca	
	55	9	7	12	17	=100.

The genital segment swollen at the anterior $\frac{1}{5}$ of the segment. The furcal rami 4.35 times as long as wide.

Male. Length, 0.64–0.68 mm. The cephalothorax and abdomen are in the proportional lengths as 69 to 31. The head is about as long as wide. The proportional lengths of the abdominal segments and furca are as follows:

Segment	Abd. 1	2	3	4	5	Furca	
	66	3	1	1	13	16	=100.

The genital segment about 1.6 times as long as wide (25:16). The process on the posterior lateral margin of the segment is very acute. The furcal rami 2.4 times as long as wide.

Immature female specimen in the copepodid stage V measured 0.88–0.95 mm, and those in the stage IV measured 0.53–0.68 mm. The immature female has no dorsal projection on the 2nd thoracic segment.

Remarks. — GIESBRECHT (1902) and FARRAN (1929) called attention to the short furcal rami and large genital segment found among the specimens taken from the Antarctic. FARRAN's specimens taken in the "Terra Nova" Expedition measured 1.16–1.38 mm. His specimens from New Zealand resembles the Mediterranean type, and those from the Antarctic have a large genital segment. The present specimens from 66°S have rather a short genital segment and longer furca. FARRAN (1936) divided the females of *conifera* taken from the Great Barrier Reef into 3 groups according to their size and other characters. The present specimens come near to his group "a" in size.

Distribution. — The species has a world-wide distribution and has been recorded from the Arctic, Antarctic, Atlantic, Indian and Pacific Oceans, and Mediterranean Sea. In the present collection the specimens were found only from the regions south of 66°S.

69. *Oncaea curvata* GIESBRECHT

(Plate XXX, Figs. 1-11; Plate XXXI, Figs. 1-3)

Oncaea curvata, GIESBRECHT, 1902, p. 42, pl. 13, figs. 12-17; FARRAN, 1929, p. 286; VERVOORT, 1957, p. 147.

Occurrence. — Sta. 15, Antarctic, 200–0 m, 13 females, 18 males, 16 immature females, 15 immature males.

Sta. 16, " , 400–0 m, 1 female, 5 males.

Sta. 17, " , 250–0 m, 42 females, 50 males,
16 immature females.

Descriptive Notes. — Female. Length, 0.59–0.75 mm. The cephalothorax and abdomen are in the proportional lengths as 65 to 35. The body transparent and soft-skinned. The lateral margin of the 4th thoracic segment contracts anteriorly. The posterior margin of the 4th thoracic segment narrowly rounded in lateral view, extends about to the middle of the 5th thoracic segment.

The abdominal segments and furca are in the proportional lengths:

Segment	Abd. 1–2	3	4	5	Furca
	47	12	10	15	16 =100.

The genital segment swollen laterally about the middle of the segment in dorsal view, about 1.2 times as long as broad. The ventral surface of the segment is swollen about in the middle of the segment. The furcal rami 3 times as long as broad. The distal margin of the ramus dilated when viewed from the lateral (Fig. 3).

The 1st antenna 6-jointed, extends about to the posterior end of the head. The joints are in the following proportional lengths:

Joint	1	2	3	4	5	6
	10	19	45	12	6	8=100.

In the 4th foot the 3rd joint of the endopod is slender and long, exceeding the distal end of the exopod. The distal spine of the same joint is about as long as joint itself. The 5th foot is very small with 2 apical and a proximal setae.

Male. Length, 0.48–0.52 mm. The cephalothorax and abdomen are in the proportional lengths as 67 to 33. The head contracts anteriorly. The 4th thoracic segment as in the female.

The abdominal segments and furca are in the proportional length:

Segment	Abd. 1	2	3	4	5	Furca
	58	4	3	4	15	16 =100.

Pelagic Copepoda

The genital segment is elongate ovate in shape, about 1.6 times as long as broad. The ventral surface slightly swollen. The furcal rami 2.2 times as long as broad. The distal end of the ramus dilated in lateral view.

The 1st antenna 5-jointed. The distal 3 joints are completely fused.

Distribution. — This small species is a characteristic copepod of the Antarctic, and recorded from the area 69°48' S, 81°19' W (GIESBRECHT), 64°59' S, 117°01' E (VERVOORT), 65°27' S, 54°35' E, (VERVOORT), 67°59' S, 41°08' E (present record).

70. *Oncaea media* GIESBRECHT

(Plate XXXI, Figs. 4-9)

Oncaea media, GIESBRECHT, 1892, p. 591, pl. 2, fig. 12, pl. 47, figs. 1, 11, 29-33, 40; FARRAN, 1929, p. 285; 1936, p. 126; SEWELL, 1947, p. 261.

Occurrence. — Sta. 1, South China Sea, Surface, 1 female, 2 males.

Sta. 2, Indian Ocean, " , 4 females, 8 males,

2 immature females.

Sta. 3, " , " , 1 female, 2 males,

1 immature female.

Sta. 4, " , " , 1 female, 2 males.

Sta. 5, " , " , 4 females, 1 immature female.

Sta. 6, " , " , 1 immature female.

Sta. 8, Off Cape of Good Hope, Surface, 90 females, 150 males.

Descriptive Notes. — There are, as previous authors have pointed out, a great range in size. SEWELL divided the species into two forms, forma *major* and forma *minor*. They measured 0.733–0.817, and 0.58–0.65 mm respectively. The present females ranged in size from 0.55 mm to 0.79 mm. The anterior and posterior regions of the body are in the proportional lengths as 63 to 37. The proportional lengths of the segments of the posterior region are as follows:

Segment	Th. 5	Abd. 1–2	3	4	5	Furca
	10	54	4	7	8	16 =100.

The furcal rami 2.6 times as long as broad. The distal segments of the abdomen are of yellowish brown colour.

Male. Length, 0.51–0.60, 0.70–0.93 mm. The male varies also greatly in size. The anterior and posterior regions of the body are in the proportional lengths as 59 to 41. The proportional lengths of the segments of the posterior region are as follows:

Segment	Th. 5	Abd. 1	2	3	4	5	Furca
	11	62	5	3	3	5	11 =100 (large form)
	12	62	5	2	2	5	12 =100 (small form).

The furcal rami about 2.6 times as long as broad.

Remarks. — In the present material the small form is much inferior in number, viz. 12 individuals out of 98 in the female, and 11 out of 156 in the male. These two forms differ only in size, and there is no structural difference.

Distribution. — The species is widely distributed in the tropical and temperate waters of the oceans and also in the Mediterranean and Arabian Seas. FARRAN recorded the occurrence of the species as far south as Ross Island in the Antarctic. But his record appears to be somewhat doubtful. FARRAN does not mention the sizes of his male taken from the Antarctic. He gives only those of the specimens obtained from the Tropical Atlantic and Off New Zealand. The male of *O. media* comes near to that of *O. conifera* in size, and is easily confused with the latter.

71. *Oncaea notopus* GIESBRECHT

(Plate XXXII, Figs. 1-7)

Oncaea notopus, GIESBRECHT, 1892, pp. 591, 603, pl. 47, figs. 12, 15, 45; 1902, p. 41, pl. 13, figs. 1-6; VERVOORT, 1957, p. 148.

Occurrence. — Sta. 15, Antarctic, 200-0 m, 4 females.

Sta. 16, " , 400-0 m, 1 female.

Sta. 17, " , 250-0 m, 4 females, 4 males.

Descriptive Notes. — Female. Length, 0.63-0.68 mm. The cephalothorax and abdomen are in the proportional lengths as 68 to 32. The frontal margin of the head evenly rounded in dorsal view. The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1-2	3	4	5	Furca
	50	14	7	15	14 = 100.

The genital segment 1.6 times as long as wide, swollen at the middle section. The furcal rami twice as long as wide.

The 5th foot slender and long, extends about to the level of the proximal 1/3 of the genital segment, and is furnished with 2 apical setae and a proximal one.

Male. Length, 0.49-0.52 mm. The proportional lengths of the cephalothorax and abdomen are as 68 to 32. The head slightly tapers anteriorly. The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1	2	3	4	5	Furca
	59	5	3	3	15	15 = 100.

The genital segment about 1.2 times as long as broad. The lateral distal margin

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of the segment triangularly produced. The furcal rami 1.7 times as long as broad. The 5th foot smaller in proportion to that of the female.

Immature females in the copepodid stage V. Length, 0.50–0.60 mm. The cephalothorax and abdomen are in the proportional lengths as 70 to 30. The abdomen 3-segmented, their proportional lengths are as follows:

Segment	Abd. 1	2	3	Furca
	50	9	23	18 = 100.

The 5th foot not fully developed and short.

Immature male in the copepodid stage V. Length, 0.42–0.49 mm. The cephalothorax and abdomen are in the proportional lengths as 76 to 24. The abdomen 3-segmented. The segments and furca are in the proportional lengths:

Segment	Abd. 1	2	3	Furca
	33	17	29	21 = 100.

Distribution. — GIESBRECHT recorded the species in the locality 99°–124°W, 11°N–3°S. from the depth 1000–0 m, and from the Antarctic 69°48'S, 81°19'W. VERVOORT recorded a single specimen from the Station 65°27'S, 54°35'E. This small form appears to have a fairly wide distribution in the deep water of the Indian Ocean. HARDY and GUNTHER recorded the species abundantly from deeper level in the adjacent waters of South Georgia Whaling Ground.

72. *Oncaea venusta* PHILIPPI

Oncaea venusta, GIESBRECHT, 1892, p. 602, pl. 3, fig. 7, pl. 47, figs. 2, 5, 13, 17, 39, 44, 50, 54, 58; *Oncaea venusta* var. *venella*, FARRAN, 1929, p. 284, fig. 33; *Oncaea venusta*, SEWELL, 1947, p. 263.

Occurrence. — Sta. 1, South China Sea, Surface, 1 female.

Sta. 2, Indian Ocean, Surface, 9 females, 1 male.

Sta. 3, " , " , 3 females.

Sta. 5, " , " , 4 females, 8 males.

Sta. 6, " , " , 1 female.

Sta. 8, Off Cape of Good Hope, Surface, 9 females, 4 males,
1 immature female.

Sta. 10, Antarctic, Surface, 1 female.

Descriptive Notes. — Two forms, the large and small forms, are present in the material. The present female specimen of the large form which SEWELL called forma *typica* measured 1.13–1.39 mm. The proportional lengths of the anterior and posterior regions of the body are as 57 to 43. The anterior region is 1.7 times as long as wide (63:37). The proportional lengths of the segments of the posterior region as follows:

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	13	48	5	5	9	20 =100.

The furcal rami 4 times as long as broad.

The small form which was named forma *venella* by FARRAN measured 0.90–1.00 mm. The proportional lengths of the anterior and posterior regions of the body are as 60 to 40. The anterior region about 1.6 times as long as broad (61:39). This is more slender than in forma *typica*. The posterior region has the segments in the following proportional lengths:

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	10	45	7	7	9	22 =100.

The furcal rami 4 times as long as broad.

No structural differences were observed between these two forms.

Male. Length, 0.74–1.07 mm. The anterior and posterior regions of the body are in the proportional lengths as 60 to 40. The posterior region has the segments in the following proportional lengths:

Segment	Th. 5	Abd. 1	2	3	4	5	Furca
	10	60	4	2	2	7	15 =100.

The furcal rami 4 times as long as broad. The genital segment about 1.6 times as long as broad (36:21) in the small form, and about 1.3 times as long as broad (47:37) in the large form.

Distribution. — Forma *typica* SEWELL has a wide distribution in the tropical and temperate waters of the three oceans, and in the Mediterranean Sea. Forma *venella* has been recorded from the tropical and temperate Atlantic, off New Zealand, Great Barrier Reefs of Australia, Arabian Sea, and Indian Ocean. The specimens from Japanese waters belong to forma *typica*.

Family SAPPHIRINIDAE

Genus *Sapphirina* THOMPSON

73. *Sapphirina angusta* DANA

Sapphirina angusta, GIESBRECHT, 1892, p. 620, pl. 52, figs. 5, 6, 20, 53, 55, 58, 66, pl. 53, figs. 6, 17, 29, 30, 55, pl. 54, figs. 2, 8, 17, 20, 60, 61; MORI, 1937, p. 125, pl. 68, figs. 1–5.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 3 females.

Descriptive Notes. — Female. Length, 2.82 mm. The proportional lengths of the anterior and posterior regions of the body are as 72 to 28. The anterior region is slender, about 2.5 times as long as broad. The dorsal lenses are set closely together.

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The posterior region of the body has the segments in the following proportional lengths :

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	14	21	10	9	11	35 = 100.

The distal border of the 2nd to 4th abdominal segment is finely serrated on the posterior surface. The furcal rami 2 times as long as broad (33:17). The median dorsal seta of the furca is situated at the distal 1/3 of the ramus.

The 1st antenna 5-jointed. The joints are in the following proportional lengths :

Joint	1	2	3	4	5
	18	42	17	10	13 = 100.

In the 2nd foot the endopod is about as long as the exopod. The 3rd joint of the endopod carries 3 apical spines. In the 4th foot the endopod is slightly shorter than the exopod.

Remarks. — The present specimen is much smaller in size than those previously reported. FARRAN's specimens from the Atlantic measured 3.24–3.65 mm in the female, and 4.8–5.1 mm in the male. The specimens from Japanese waters measured about 3–4 mm in the female.

Distribution. — The species is widely distributed in the tropical and temperate regions of the three oceans, and also in the Mediterranean Sea.

74. *Sapphirina gemma* DANA

Sapphirina gemma, GIESBRECHT, 1892, p. 620, pl. 52, figs. 22, 62, 64, pl. 53, figs. 19, 31, 32, 61, pl. 54, figs. 10, 12; FARRAN, 1929, p. 287; MORI, 1937, p. 125, pl. 68, figs. 6–11; *ovatlanceolata-gemma*, SEWELL, 1947, p. 268.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 2 females.

Descriptive Notes. — Female. Length, 2.95 mm. The anterior and posterior regions of the body are in the proportional lengths as 62 to 38. The anterior region is 1.9 times as long as broad. The eyes small, situated ventrally. The head 1.14 times as long as broad.

The posterior region has the segments in the following proportional lengths :

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	14	20	12	11	13	30 = 100.

The furcal rami about 2.1 times as long as broad. The median dorsal seta is situated on the distal 2/5 of the ramus.

The 1st antenna 5-jointed. The joints are in the following proportional lengths :

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Joint	1	2	3	4	5
	18	40	18	11	13=100.

The 2nd antenna has the joints in the proportional lengths :

Joint	1	2	3	4 (including terminal claw)
	31	44	11	24=100.

In the 2nd foot the 3rd joint of the endopod has a single outer marginal, 2 terminal, and 1 inner marginal spines. The exopod has 3 outer marginal setae on the 3rd joint. The 4th foot has 2 outer marginal setae on the 3rd joint of the exopod. The endopod has 2 outer marginal and 1 inner marginal spines on the 3rd joint.

The another female specimen measured 3.25 mm. The proportional lengths of the anterior and posterior regions of the body are as 63 to 37. The anterior region 2.2 times as long as broad (81:36). The posterior region has the segments in the following proportional lengths :

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	14	21	14	12	13	26 =100.

The furcal rami about 2 times as long as broad.

The 1st antenna has the joints in the following proportional lengths :

Joint	1	2	3	4	5
	17	41	20	9	13=100.

In other respects the specimen has the similar characters as in the foregoing.

Remarks. — The specimen from the Japanese waters described by MORI measured 1.85–3.15 mm. The specimens appear to be *S. ovatolanceolata* DANA.

Distrsbution. — The species has a wide distribution in the warm region of the three oceans and in the Mediterranean Sea.

75. *Sapphirina intestinata* GIESBRECHT

Sapphirina intestinata, GIESBRECHT, 1892, p. 619, 643, pl. 52, figs. 10, 11, 36, pl. 53, figs. 11, 47, pl. 54, figs. 7, 29, 62; FARRAN, 1929, p. 290; MORI, 1937, p. 128, pl. 69, figs. 13–17.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 immature female.

Descriptive Notes. — Immature female in the copepodid stage IV. Length, 1.02 mm. The anterior and posterior regions of the body are in the proportional lengths as 66 to 34. The cephalothorax broad, 1.4 times as long as broad. The posterior region 4-segmented. The segment and furca are in the following proportional lengths :

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Segment	Th. 5	Abd. 1	2	3	Furca
	20	9	11	26	34 =100.

The furcal rami twice as long as broad.

The 1st antenna 5-jointed. The 1st to 4th swimming feet have each 2-jointed exopod and endopod. The 4th foot has a 1-jointed endopod furnished with an apical and an inner marginal seta.

Distribution. — The species has been recorded from the tropical and temperate regions of the Indian and Pacific Oceans.

Genus *Copilia* DANA

76. *Copilia hendorffi* DAHL

Copilia hendorffi, LEHNHOFER, 1926, pp. 129, 138, text-fig. 8, 1-8, text-fig. 15, 1-7; FARRAN, 1929, p. 290; SEWELL, 1947, p. 269.

Occurrence. — Sta. 5, Indian Ocean, Surface, 1 immature female.

Sta. 7, " " " " , 1 immature female.

Descriptive Notes. — Immature female. Length, 0.95 mm and 1.165 mm. The specimens are in the copepodid stage IV. The anterior and posterior regions of the body have the proportional lengths as 62 to 38. The posterior region has the segments in the following proportional lengths:

Segment	Th. 5	Abd. 1	2	3	Furca
	9	6	6	17	62 =100 (small specimen)
	9	9	7	10	65 =100 (large specimen)

The furcal rami 9.5 times as long as broad.

The 1st to 3rd swimming feet have each 2-jointed exopod and endopod. The 4th foot has 2-jointed exopod and unjointed endopod.

Distribution. — In the Pacific off New Zealand (FARRAN). In the Indian Ocean and Arabian Sea. In the south-east region of the Atlantic.

Family LICHOMOLGIDAE

Genus *Pseudanthessius* CLAUS

77. *Pseudanthessius minimus* sp. nov.

(Plate XXXIII, Figs. 1-18)

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female, 1 male, 1 immature male.

Descriptive Notes. — Female. Length, 0.62 mm. The anterior and posterior

regions of the body are in the proportional lengths as 65 to 35. The anterior region is ovate in shape, about 1.8 times as long as broad. The frontal margin of the head narrowly rounded in dorsal view, but evenly rounded when viewed from the lateral. The rostrum one-pointed and stout.

The posterior region has the segments in the following proportional lengths:

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	14	42	9	7	14	41 = 100.

The genital segment swollen laterally at the proximal half of the segment. The mid-dorsal region is considerably swollen and carries 2 egg sacks containing each about 8 eggs. (0.04 mm in diameter). The furcal rami 1.5 times as long as broad. The rami are slightly asymmetrical in the present specimen. The left ramus is slightly longer than the right (13:12).

The 1st antenna 7-jointed, extends about to the middle of the head. The joints are in the following proportional lengths:

Joint	1	2	3	4	5	6	7
	13	5	27	8	17	15	15 = 100.

The 2nd antenna 5-jointed. The distal joint has 5 setae. The mandible has a strong spine on the upper margin, and a slender one on the distal corner. The distal lateral margin is furnished with a row of short spines. The 1st maxilla 1-jointed. The apical portion is furnished with 4 spines. The 2nd maxilla is strongly serrated along the upper margin. The maxillipede 3-jointed. The distal joint has a strong spine.

The 1st to 3rd feet have each 3-jointed exopod and endopod. The 4th foot has 3-jointed exopod and unjointed endopod. The 5th foot is slender and furnished with 2 apical spines.

Male. Length, 0.50 mm. The anterior and posterior regions of the body are in the proportional lengths as 62 to 38. The head fused with the thoracic segment, and is narrow in outline.

The posterior region of the body has the segments in the proportional lengths:

Segment	Th. 5	Abd. 1	2	3	4	5	Furca
	10	52	8	6	4	8	12 = 100.

The genital segment about as long as broad.

The 1st antenna has the joints in the following proportional lengths:

Joint	1	2	3	4	5	6	7
	14	28	7	13	13	10	15 = 100.

The mouth appendages and swimming feet are similar to those of the female except the maxillipede which has a long terminal claw.

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Remarks. — THOMPSON and A. SCOTT recorded the occurrence of *Pseudanthessius gracilis* CLAUS, *P. maximus* THOMPSON and A. SCOTT, *P. chelifera* THOMPSON and A. SCOTT, *P. concinnus* THOMPSON and A. SCOTT and *P. liber* (BRADY and ROBERTSON) from the Ceylon Pearl Banks. A. SCOTT recorded *P. weberi* A. SCOTT, *P. pectinatus* A. SCOTT, *P. parvus* A. SCOTT, and *P. obscurus* A. SCOTT from the Malay Archipelago. SEWELL recorded *P. gracilioides* SEWELL from the Arabian Sea. WILSON (1950) recorded *P. pacificus* from the Philippine Island. The present specimen is much smaller in size than those hitherto been reported. The species comes near in size to *P. tenuis* NICHOLLS, but differs from it in the structure of the 5th pair of feet.

Distribution. — Indian Ocean, 08°15'S, 76°15'E. (present record).

Family CORYCAEIDAE

Genus *Corycaeus* DANA

78. *Corycaeus (Corycaeus) crassiusculus* DANA

Corycaeus (Corycaeus) crassiusculus, M. DAHL, 1912, p. 21, pl. 3, figs. 1-7; FARRAN, 1929, p. 291, fig. 36; SEWELL, 1947, p. 272, text-fig. 69, a-h; TANAKA, 1957, p. 80, pl. 3, figs. 12-15.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female.

Sta. 4, " , " , 2 females.

Sta. 5, " , " , 2 males.

Descriptive Notes. — Female. Length, 1.72–1.80 mm. The cephalothorax and abdomen are in the proportional lengths as 63 to 37. The abdominal segments and furca are in the proportional lengths:

Segment	Abd. 1	2	Furca
	43	23	34 =100.

Male. Length, 1.41 mm. The cephalothorax and abdomen are in the proportional lengths as 60 to 40. The abdominal segments and furca are in the proportional lengths:

Segment	Abd. 1	2	Furca
	37	23	40 =100.

Remarks. — According to M. DAHL *C. clausi* is the Atlantic representative of *C. crassiusculus*. SEWELL (1947) states "it seems to be impossible to draw any hard and fast line of differentiation between the two forms *clausi* and *crassiusculus*, and it is preferable to regard them as two forms of a single species, namely, an Indo-Pacific form and an Atlantic form". FARRAN (1936) suggests that the differences between the females of *C. crassiusculus* and *C. vitreus* are not very clearly marked.

Distribution. — Widely distributed in the tropical and temperate regions of the oceans, and the Mediterranean Sea.

79. *Corycaeus (Corycaeus) speciosus* DANA

Corycaeus speciosus, GIESBRECHT, 1892, p. 673, pl. 51, figs. 39, 40; *Corycaeus (Corycaeus) speciosus*, M. DAHL, 1912, p. 13, pl. 1, figs. 1–13, pl. 2, figs. 1–4; TANAKA, 1957, p. 79, pl. 3, figs. 1–6.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 female, 4 males.

Sta. 4, " , " , 2 males.

Sta. 6, " , " , 1 female.

Female. Length, 1.69 mm, 2.05 mm.

Male. Length, 1.62 mm.

Distribution. — Widely distributed in the tropical and temperate regions of the oceans and in the Mediterranean Sea.

80. *Corycaeus (Urocorycaeus) longistylis* DANA

Corycaeus longistylis, GIESBRECHT, 1892, p. 674, pl. 51, figs. 36, 37; *Corycaeus (Urocorycaeus) longistylis*, M. DAHL, 1912, p. 42, pl. 6, figs. 6–13, pl. 7, figs. 1–3; TANAKA, 1957, p. 83, pl. 5, figs. 8–12.

Occurrence. — Sta. 7, Indian Ocean, Surface, 1 male.

Male. Length, 2.22 mm. The anterior and posterior regions of the body are in the proportional lengths as 48 to 52. The proportional lengths of the abdominal segment and furca are as 40 to 60.

Distribution. — Widely distributed in the tropical and temperate waters of the Pacific and Indian Oceans. From Japanese waters MORI redorded the species in the southern regions, and TANAKA in the Pacific Coast of Middle Japan.

81. *Corycaeus (Ditrichocorycaeus) andrewsi* FARRAN

(Plate XXXIV, Figs. 1–2)

Corycaeus andrewsi, FARRAN, 1911, p. 294, pls. 13, 14; *Corycaeus (Ditrichocorycaeus) andrewsi*, M. DAHL, 1912, p. 78, pl. 9, figs. 10–18; TANAKA, 1957, p. 86, pl. 6, figs. 9–12.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 male.

Descriptive Notes. — Male. The specimen was mutilated. The total length may be about 0.84 mm. The cephalothorax measured 0.77 mm. The proportional lengths of the genital and anal segment are as 74 to 46. The genital segment oval in shape, 1.6 times as long as broad, tapers gradually to the proximal part. The ventral hook small, directs downwards. The cylindrical part of the segment $2/5$ the length of the distal border of the segment. The

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anal segment about 1.5 times as long as it is broad at the proximal. The posterior border of the anal segment is slightly narrower than that of the anterior (8:9).

Distribution. — Recorded from the west coast of Ceylon, the west coast of Sumatra, the Bismark Archipelago, the north of New Guinea, the Great Barrier Reefs of Australia, and the adjacent seas of Japan.

82. *Corycaeus (Ditrichocorycaeus) asiaticus* F. DAHL

(Plate XXXIV, Figs. 3, 4)

Corycaeus (Ditrichocorycaeus) asiaticus, M. DAHL, 1912, p. 74, pl. 11, figs. 1-9; FARRAN, 1936, p. 137; TANAKA, 1957, p. 87, pl. 6, figs. 13-19.

Occurrence. — Sta. 1, South China Sea, Surface, 1 male.

Sta. 2, Indian Ocean, Surface, 4 males.

Sta. 5, " " " " , 1 male.

Sta. 8, Off Cape of Good Hope, Surface, 28 males.

Descriptive Notes. — Male. Length, 1.02-1.22 mm. The proportional lengths of the cephalothorax and abdomen are as 60 to 40. The 4th thoracic margin is produced posteriorly into a very acute process on each side.

The abdominal segments and furca have the following proportional lengths:

Segment	Abd. 1	2	Furca
	50	23	27 = 100.

The genital segment broadish oval, 1.3 times as long as broad. The cylindrical part short, about 1/4 the length of the posterior border of the segment (3:13). The ventral hook slender and long, directs downwards. The anal segment 1.6 times as long as broad. The lateral margins of the segment parallel. The furcal rami 4.8 times as long as it is broad at the proximal.

Distribution. — The species has a fairly wide distribution in the tropical and temperate waters of Indian and Pacific Oceans.

83. *Corycaeus (Ditrichocorycaeus) dahli* TANAKA

(Plate XXXIV, Figs. 5-7)

Corycaeus tenuis, FARRAN, 1911, p. 1291, pl. 12, figs. 8, 9; *Corycaeus (Ditrichocorycaeus) lubbocki*, M. DAHL, 1912, p. 64, pl. 10, figs. 20-28; *Corycaeus lubbocki*, FARRAN, 1936, p. 137; *Corycaeus (Ditrichocorycaeus) dahli*, TANAKA, 1957, p. 89, pl. 7, figs. 14-17, pl. 8, figs. 1-5.

Occurrence. — Sta. 4, Indian Ocean, Surface, 1 male.

Sta. 8, Off Cape of Good Hope, Surface, 17 females, 183 males.

Descriptive Notes. — Female. Length, 1.05-1.21 mm. The proportional lengths

of the cephalothorax and abdomen are as 62 to 38. The abdominal segments and furca have the following proportional lengths:

Segment	Abd. 1	2	Furca
	36	20	44 =100 (dorsal)
	33	22	45 =100 (ventral).

The ventral hook of the genital segment small, directing posteriorly. The furcal rami straight in lateral view.

Male. Length, 0.775–0.985 mm. The cephalothorax and abdomen are in the proportional lengths as 57 to 43. The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1	2	Furca
	47	19	34 =100.

The genital segment has a strong ventral hook directing postero-ventrally. The cylindrical part is 1/3 the length of the posterior border of the segment (4:11). The anal segment about 1.5 times as long as it is wide at the proximal.

Remarks.—The present species is identical with the species which I have previously described as *C. dahli* taken from the adjacent waters of Japan. The species is distinct from *C. lubbocki* GIESBRECHT which has been redescribed by FRÜCHTL and by SEWELL in having a small ventral hook on the genital segment, and in having rather a long anal segment. The species differs also from *C. africanus* described and figured by SEWELL in having a small ventral hook which can be distinguished in shape from that figured by SEWELL (text-fig. 70, A.), and in the shape of the dorsal outline of the genital segment, though these species have quite similar proportional lengths in the abdominal segments and furca. The present specimen agrees well with the figures of *lubbocki* given by M. DAHL (pl. X, figs. 20, 21) in having a small ventral hook and a rounded small dorsal prominence on the genital segment. *C. tenuis* FARRAN (non GIESBRECHT) which measures 1.05 mm. has a similar ventral hook and proportional lengths of the abdominal segments and furca as those of *C. lubbocki* M. DAHL. I agree M. DAHL's opinion that the form described by FARRAN under the name *tenuis* is synonym of *C. lubbocki* M. DAHL. Furthermore, absence of FARRAN's *tenuis* in the record of the Great Barrier Reef Expedition will indicate that *C. tenuis* FARRAN is synonym of *C. lubbocki* M. DAHL which was referred to *C. lubbocki* GIESBRECHT by FARRAN (1936). FARRAN's *tenuis* comes nearest in size and in other characters to *C. dahli*. I believe that *C. tenuis* FARRAN, *C. lubbocki* M. DAHL are synonymous to the present species.

A female measuring 1.085 mm had abnormal furcal rami as shown in the figure.

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Distribution. — Christmas Island, (FARRAN), China Sea and Eastern Pacific, (M. DAHL), Great Barrier Reef (FARRAN), adjacent waters of Japan (TANAKA).

84. *Corycaeus (Ditrichocorycaeus) erythraeus* CLEVE

(Plate XXXV, Figs. 1-8)

Corycaeus dubius, FARRAN, 1911, p. 292, pl. 12, 14; *Corycaeus (Ditrichocorycaeus) dubius*, M. DAHL, 1912, p. 71, pl. 1, 10, figs. 11-19; *Corycaeus erythraeus*, GURNEY, 1926, p. 191, fig. 23, a-d; FARRAN, 1926, p. 137; *Corycaeus (Ditrichocorycaeus) dubius*, TANAKA, 1957, p. 88, pl. 7, figs. 5-13.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 1 female, 3 males.

Descriptive Notes. — Female. Length, 1.03 mm. The anterior and posterior regions of the body are in the proportional lengths as 62 to 38. The head separates from the 1st thoracic segment. The 3rd thoracic segment is produced posteriorly into long spiniform processes, extending to the level of the middle of the genital segment. The 4th thoracic segment is produced backwardly into sharp spines that direct somewhat outwardly.

The proportional lengths of the abdominal segments and furca are as follows:

Segment	Abd. 1	2	Furca
	32	29	38 = 100 (dorsal)
	32	32	36 = 100 (lateral).

The genital segment swollen laterally, 1.24 times as long as broad. The lateral margins of the anal segment nearly parallel, 2 times as long as it is broad at the distal end. The furcal rami divergent, 8 times as long as it is broad at the proximal.

In the 2nd antenna the spine arising from the 1st basal is more than 3 times as long as that from the 2nd basal joint.

In the 2nd foot the terminal spine of the exopod is serrated on the inner distal margin. The number of serration is about 4.

Male. Length, 0.86-0.88 mm. The cephalothorax and abdomen are in the proportional lengths as 55 to 45. The abdominal segments and furca are in the proportional lengths:

Segment	Abd. 1	2	Furca
	41	25	34 = 100.

The ventral hook of the genital segment is slender and bent posteriorly.

Remarks. — The following 4 species have the abdominal segments and furca quite similar in proportional lengths:

<i>Corycaeus erythraeus</i> CLEVE	31.25	31.25	37.5
<i>Corycaeus dubius</i> FARRAN	29.17	31.94	38.89

<i>Corycaeus erythraeus</i> GURNEY	32.64	29.67	37.69
<i>Corycaeus dubius</i> TANAKA	31	33	36

These figures agree fairly well those of the present specimen. FARRAN (1936) referred his *dubius* to *C. erythraeus* CLEVE, and stated that it is evident from GURNEY's description that there is no essential difference between *C. erythraeus* and *C. dubius*. The difference between CLEVE's and GURNEY's *erythraeus* is in the proportional lengths of the spine arising from the 1st and 2nd basal joints of the 2nd antenna. In CLEVE's *erythraeus* the spine arising from the 2nd basal is the half the length of that from the 1st basal joint, whereas, in GURNEY's specimen the 2nd basal spine is only about 1/3 the length of the 1st basal spine and reaches only half-way along the 2nd basal. GURNEY states that there can be very little doubt that his species from the Suez Canal is the same as that described by CLEVE from a little further south in the Red Sea. The present specimen is, without doubt, *C. erythraeus* CLEVE.

Distribution. — The species is distributed in the Indo-Pacific and recorded from the Christmas Island (FARRAN), Madagascar (M. DAHL), Suez Canal (GURNEY), Red Sea (CLEVE) and Japanese waters (TANAKA).

85. *Corycaeus (Ditrichocorycaeus) subtilis* M. DAHL

(Plate XXXVI, Figs. 1-3)

Corycaeus (Ditrichocorycaeus) subtilis, M. DAHL, 1912, p. 80, pl. 8, figs. 9-16; TANAKA, 1957, p. 88, pl. 7, figs. 1-4.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 2 females, 2 males.

Descriptive Notes. — Female. Length, 0.765–0.79 mm. The cephalothorax and abdomen are in the proportional lengths as 69 to 31. The head separates from the 1st thoracic segment. But the line of demarcation is very feeble. The wing-like expansion of the 3rd thoracic segment extends only to the level of the proximal 1/5 of the genital segment. The 4th thoracic segment ends into short pointed processes.

The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1	2	Furca
	45	27	28 = 100.

The proximal part of the genital segment dilated, and has no ventral hook. The anal segment 1.4 times as long as it is broad at the anterior border. The furcal rami slightly divergent, 3.5 times as long as it broad at the proximal.

Male. Length, 0.70 mm. The cephalothorax and abdomen are in the proportional lengths as 60 to 40. The abdominal segments and furca are in the following proportional lengths:

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Segment	Abd. 1	2	Furca
	47	23	30 = 100.

The genital segment elongate ovate, 1.8 times as long as it is broad at the middle section. The anal segment about 1.9 times as long as it is broad at the posterior border. The furcal rami about 4.3 times as long as it is broad at the proximal.

Distribution. — Recorded in the Indo-Pacific: from the Aru Archipelago (FRÜCHTL), Bismark Archipelago (M. DAHL), Australian Great Barrier Reef (FARRAN), Japanese waters (TANAKA).

86. *Corycaeus (Onychocorycaeus) agilis* DANA

(Plate XXXVI, Figs. 4, 5)

Corycaeus (Onychocorycaeus) agilis, M. DAHL, 1912, p. 84, pl. 12, figs. 10–20; TANAKA, 1957, p. 94, pl. 8, figs. 16–18, pl. 9, figs. 1–5.

Occurrence. — Sta. 1, South China Sea, Surface, 2 males.

Sta. 2, Indian Ocean, Surface, 33 females, 47 males.

Sta. 3, " , " , 1 female, 35 males.

Sta. 4, " , " , 14 females, 26 males.

Sta. 5, " , " , 4 females, 13 males.

Sta. 6, " , " , 1 female, 12 males,

1 immature female.

Sta. 7, " , " , 5 females, 30 males.

Sta. 8, Off Cape of Good Hope, Surface, 4 females, 75 males.

Descriptive Notes. — Length, 0.92–1.03 mm. The cephalothorax and abdomen are in the proportional lengths as 60 to 40. The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1	2	Furca
	32	29	39 = 100.

Male. Length, 0.70–0.90 mm. The cephalothorax and abdomen are in the proportional lengths as 60 to 40. The abdominal segments and furca area in the following proportional lengths:

Segment	Abd. 1	2	Furca
	39	28	33 = 100.

The genital segment about 1.6 times as long as broad (15 : 16). The cylindrical part about 3/7 the length of the posterior border of the segment. The anal segment has nearly parallel lateral margins, 2.5 times as long as it is broad

at the anterior border. The furcal rami 10 times as long as broad, and are slightly asymmetrical. The right ramus is longer than the left.

Remarks.—The male specimens taken from Station 8, off the Cape of Good Hope, are larger in size (0.84–0.90 mm) than those from the other stations (0.70–0.79 mm). A male specimen measuring 0.76 mm had a long furcal rami (Fig. 4). The segments and furca have the proportional lengths:

Segment	Abd. 1	2	Furca
	36	25	39 = 100.

The genital segment had a trace of the ventral hook.

Distribution.—Widely distributed in the tropical waters of the Indian and Pacific Oceans. The species is the most abundant among those belonging to the genus *Corycaeus*, and that the male is more plentiful than the female.

87. *Corycaeus* (*Onychocorycaeus*) *giesbrechti* F. DAHL

(Plate XXXVI, Fgs. 6–10)

Corycaeus venustus, GIESBRECHT, 1892, p. 695, pl. 51, figs. 32–34, 47; *Corycaeus* (*Onychocorycaeus*) *giesbrechti*, M. DAHL, 1912, p. 88, pl. 12, figs. 1–9.

Occurrence.—Sta. 7, Indian Ocean, Surface, 2 females.

Sta. 8, Off Cape of Good Hope, Surface, 21 males.

Descriptive Notes.—Female. Length, 1.05 mm. The specimens were slightly damaged. The cephalothorax and abdomen are in the proportional lengths as 64 to 36.

The abdominal segments and furca are in the proportional lengths:

Segment	Abd. 1	2	Furca
	47	23	30 = 100.

The genital segment elongate ovate, 1.5 times as long as broad, and 1.5 times as long as high. The anal segment wider at the proximal than at the distal end, and 2 times as long as it is broad at the posterior border (18:9). The furcal rami about 7 times as long as broad (49:7). The present female specimen differs from *C. giesbrechti* described by M. DAHL in the proportional lengths of the abdominal segments and furca (46:26:28) and in the more robust genital segment.

Male. Length, 0.84–0.90 mm. The cephalothorax and abdomen are in the proportional lengths as 60 to 40. The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1	2	Furca
	40	27	33 = 100.

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The genital segment elongate ovate, about 2 times as long as broad. The ventral surface of the segment has a median hook. The cylindrical part is 1/1.6 the length of the posterior border of the segment. The anal segment has parallel lateral margins, 2.5 times as long as it is broad at the anterior border (19:7.5). The furcal rami 10 times as long as broad (25:2.5).

Remarks.—The male closely resembles *C. agilis* in general appearance. The shape of the 4th thoracic segment which is more produced in the present specimen, the slender genital segment with a small ventral hook, and the large cylindrical part of the genital segment are the characters which distinguish the specimen from the male of *C. agilis*.

Distribution.—The species has been recorded from the Mediterranean Sea (M. DAHL), tropical region of the Atlantic (M. DAHL, FARRAN), Pacific (ESTERLY, GIESBRECHT, WILSON), and Indo-Pacific (A. SCOTT, M. DAHL).

88. *Corycaeus* (*Onychocorycaeus*) *pacificus* F. DAHL

(Plate XXXVII, Figs. 1-3)

Corycaeus (Onychocorycaeus) pacificus, M. DAHL, 1912, p. 103, pl. 14, figs. 1–10; SEWELL, 1947, p. 285; TANAKA, 1957, p. 95, pl. 9, figs. 13–29.

Occurrence.—Sta. 2, Indian Ocean, Surface, 1 female.

Sta. 6, " , Surface, 1 male.

Sta. 8, Off Cape of Good Hope, Surface, 1 female, 2 males.

Descriptive Notes.—Female. Length, 1.10–1.21 mm. The cephalothorax and abdomen are in the proportional lengths as 68 to 32. The lateral process of the 4th thoracic segment narrowly rounded, not sharply pointed. The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1	2	Furca
	57	21	22 = 100.

The anal segment tapers gradually toward the distal, and about as long as it is broad at the anterior border. The furcal rami about 5 times as long as broad.

Male. Length, 1.05–1.12 mm. The cephalothorax and abdomen are in the proportional lengths as 58 to 42. The wing-like expansion of the 4th thoracic segment is short, and terminates into a small knob which is rounded at the apex.

The abdominal segments and furca are in the following proportional lengths:

Segment	Abd. 1	2	Furca
	54	21	25 = 100.

The genital segment 1.7 times as long as broad (51:31). The ventral hook absent. The cylindrical part about half the length of the posterior border of

the segment (11:5). The anal segment has parallel lateral margins, and about 2 times as long as it is broad at the anterior border of the segment. The posterior border of the segment where the furcal ramus articulates on each side is armed with two groups of spinules. The furcal rami 8 times as long as broad.

Distribution. — Widely distributed in the tropical and temperate regions of the Pacific and Indian Oceans, and recorded from the Philippine Island, the China Sea, the Japanese, the north of Aleutian Island (WILSON), the Malay Archipelago, Ceylon, the Laccadive Sea, the Maldive Archipelago, the Red Sea, and the Suez Canal.

89. *Corycaeus (Onychocorycaeus) pumilus* M. DAHL

(Plate XXXVII, Figs. 4-8)

Corycaeus (Onychocorycaeus) pumilus, M. DAHL, 1912, p. 91, pl. 12, figs. 21-28; *Corycaeus (Onychocorycaeus) medius*, GURNEY, 1926, p. 165, fig. 26, a-j; SEWELL, 1947, p. 287.

Occurrence. — Sta. 8, Off Cape of Good Hope, 1 male.

Descriptive Notes. — Male. Length, 0.73 mm. The cephalothorax and abdomen are in the proportional lengths as 62 to 38. The head is about as long as broad. The eyes are separated by $\frac{3}{5}$ of its greatest diameter. The wing-like expansion of the 3rd thoracic segment extends to the level of the $\frac{1}{3}$ of the genital segment. The posterior processes of the 4th thoracic segment terminates into small slightly outturned prominences.

The abdominal segments and furca are in the following proportional lengths :

Segment	Abd. 1	2	Furca
	49	25	26 = 100.

The genital segment 1.7 times as long as broad. The ventral surface of the segment has a small median hook which directs somewhat posteriorly. The cylindrical part of the segment is half the length of the segment. No spinules are observed on the posterior border of the segment. The anal segment is of the same width throughout its length, and is 2 times as long as broad. The furcal rami about 4.7 times as long as broad.

In the 2nd antenna the spine arising from the 1st basal joint is about as long as that from the 2nd joint. The terminal spine of the 3rd joint of the exopod of the 2nd foot is straight and is of usual structure.

Remarks. — The present male, though larger in size than that described by GURNEY, comes nearest to *C. medius* in the followings: the proportional lengths of the cephalothorax and abdomen, the length of the posterior process of the 3rd thoracic segment, and the proportional lengths of the abdominal

segments and furcal rami. SEWELL described a female of *C. pumilus* M. DAHL, and is of opinion that the distinction between *pumilus* and *medius* is very doubtful. According to FARRAN his specimen of *pumilus* from the Great Barrier Reef comes nearer to *pumilus* than to *medius*. FARRAN's specimen of *pumilus* differed from M. DAHL's in the length of the furcal seta, and agreed to *medius* in the form of the abdomen and terminal setae of the furcal ramus. I am inclined to regard the both species, *medius* and *pumilus* as identical.

Distribution. — Recorded from the Bismark Archipelago (M. DAHL), the Suez Canal (GURNEY), the Red Sea (SEWELL) and the Great Barrier Reef of Australia (FARRAN).

90. *Corycaeus (Corycella) carinatus* GIESBRECHT ?

(Plate XXXVIII, Figs. 1-3)

Corycaeus carinatus, GIESBRECHT, 1892, p. 675, pl. 51, figs. 20, 26; FARRAN, 1911, p. 286, pl. 11, fig. 10; FARRAN, 1936, p. 139.

Occurrence. — Sta. 4, Indian Ocean, Surface, 2 females.

Descriptive Notes. — Female, Length, 0.91 mm. The cephalothorax and abdomen are in the proportional lengths as 68 to 32. The dorsal surface of the 3rd thoracic segment without hump. The posterior projection of the 4th thoracic segment does not reach the middle of the genital segment.

The abdominal segment and furca are in the proportional lengths as 67 to 33. The genital segment 2.7 times as long as broad, and 2.7 times as long as high. The ventral pad of the genital segment markedly produced. The furcal rami 6.7 times as long as broad.

The outer margin of the 2nd and 3rd joints of the exopod of the 1st to 3rd feet are finely serrated.

Remarks. — The present specimen is closely allied to *C. concinnus*, but differs from the latter in having rather slender furca, and in having the dorsal outline of the genital segment which is evenly rounded and highest at the middle section. The specimen comes near to *C. carinatus* but shows some differences from it in the followings: the genital segment is not so high as figured by GIESBRECHT or by FARRAN; the proximal swollen portion of the genital segment in dorsal view is less than half as wide as long, whereas, it is, according to M. DAHL, just as half as wide as long in *carinatus*. The specimen also closely resembles *C. gracilis* DANA in the proportional lengths of the abdominal segment and furca. But the occurrence of *gracilis* has been confined only to the tropical Atlantic, and it seems to be doubtful that the species has extended its distribution further to the Indian Ocean.

Distribution. — The species appears to be confined to the Indo-Pacific.

91. *Corycaeus (Corycella) concinnus* DANA

(Plate XXXVIII, Figs. 4-7)

Corycaeus concinnus, GIESBRECHT, 1892, p. 675, pl. 51, figs. 21-24; *Corycaeus (Corycella) concinnus*, M. DAHL, 1912, p. 121, pl. 15, figs. 5, 6, 11, 12, 23, 24, 33, 34; TANAKA, 1957, p. 96, pl. 10, figs. 12-16.

Occurrence. — Sta. 1, South China Sea, Surface, 2 females.

Sta. 2, Indian Ocean, Surface, 92 females, 45 males.

Sta. 3, " , " , 26 females, 42 males.

Sta. 4, " , " , 81 females, 119 males.

Sta. 5, " , " , 32 females, 47 males.

Sta. 6, " , " , 11 females, 10 males.

Sta. 7, " , " , 17 females, 35 males.

Sta. 8, Off Cape of Good Hope, Surface, 7 females, 3 males.

Descriptive Notes. — Female. Length, 0.84–0.97 mm. The cephalothorax and abdomen are in the proportional lengths as 68 to 32. The abdominal segment and furca are in the proportional lengths as 70 to 30. The genital segment is broadest at the anterior 1/5 of the segment, and 2.6 times as long as broad. The furcal rami about 5 times as long as broad (17:3.5). The furcal rami are straight and set closely together.

Male. Length, 0.82–0.84 mm. The cephalothorax and abdomen are in the proportional lengths as 58 to 42. The abdominal segment and furca in the proportional lengths as 69 to 31. The genital segment in lateral view is slender, 3 times as long as high.

Remarks. — Most of the female specimen carried usually two spermatophores on the dorsal distal surface of the genital segment. There occurred some specimens carrying no spermatophores. They measured from 0.81 mm to 0.90 mm, and had the genital segment which differed in outline from that of the specimen carrying spermatophores, viz. the distal half of the segment is more dilated laterally when viewed from the dorsal (Fig. 6).

Distribution. — Widely distributed in the Indian Ocean and in the north and south temperate and tropical Pacific.

92. *Corycaeus (Corycella) curtus* FARRAN

(Plate XXXVIII, Figs. 8-11)

Corycella curta, FARRAN, 1911, p. 286, pl. 10, figs. 7-11, figs. 1-6; *Corycaeus (Corycella) curtus*, M. DAHL, 1912, p. 113, pl. 14, figs. 26-28, pl. 15, figs. 12, 20, 28; FARRAN, 1936, p. 139.

Occurrence. — Sta. 4, Indian Ocean, Surface, 1 female.

Descriptive Notes. — Female. Length, 0.665 mm. The cephalothorax and ab-

domen are in the proportional lengths as 65 to 35. The 3rd thoracic segment without dorsal hump. The abdominal segment and furca are in the proportional lengths as 70 to 30. The genital segment slender, about 2.5 times as long as broad. The furcal rami 4 times as long as broad. The middle section of the ramus is the broadest.

The 1st to 4th swimming feet have each 3-jointed exopod and endopod. The 2nd and 3rd joints of the exopod of the 1st foot are finely serrated on the outer margin. In the 2nd and 3rd feet the 3rd joint of the exopod is rather coarsely serrated on the outer margin. The 3rd joint of the exopod of the 4th foot is not serrated on the outer margin. According to FARRAN *C. curta* has no serration on the 3rd joint of the 3rd foot.

Remarks.—The present specimen is nearest to *C. curta* in its small size and in the proportional lengths of the abdominal segment and furca. No mention has been made by M. DAHL on the serration of the 3rd joint of the exopod of the 1st to 3rd feet. The species is also closely allied to *C. rostratus* in having fine serrations on the 3rd joint of the exopod of the 1st foot.

Distribution.—The species appears to be distributed in the Indian Ocean (M. DAHL), Christmas Island (FARRAN), Great Barrier Reef of Australia (FARRAN).

93. *Corycaeus (Corycella) gibbulus* GIESBRECHT

(Plate XXXVIII, Fig. 12)

Corycaeus gibbulus, GIESBRECHT, 1892, p. 675, pl. 51, figs. 22–23; *Corycaeus (Corycella) gibbulus*, M. DAHL, 1912, p. 115, pl. 15, figs. 1–4, 9, 10, 25, 35, 36; TANAKA, 1957, p. 96, pl. 10, figs. 6–11.

Occurrence.—Sta. 1, South China Sea, Surface, 2 females, 6 males.

Sta. 2, Indian Ocean, Surface, 17 females, 67 males.

Sta. 3, " , " , 6 females, 3 males.

Sta. 4, " , " , 1 female, 11 males.

Sta. 5, " , " , 2 females, 6 males.

Descriptive Notes.—Female. Length, 0.91–1.10 mm. The cephalothorax and abdomen are in the proportional lengths as 70 to 30. The cephalothorax robust in lateral view. The 3rd thoracic segment has a dorsal hump. The genital segment and furca are in the proportional lengths as 65 to 35. The genital segment is irregular in dorsal outline, and deepest at the posterior 1/3 of the segment. The furcal rami curved slightly upward. The genital segment carried usually 2 spermatophores, sometimes carried 4.

Male. Length, 0.86–0.96 mm. The cephalothorax and abdomen are in the proportional lengths as 57 to 43. The genital segment and furca are in the proportional lengths as 70 to 30. The genital segment about 2.8 times as long as high.

Distribution. — Widely distributed in the Indo-Pacific. Recorded from the Arabian Sea, Red Sea, and adjacent waters of Japan.

94. *Corycaeus (Corycella) longicaudis* DANA?

(Plate XXXIX, Figs. 1-4)

Corycaeus longicaudis, GIESBRECHT, 1892, p. 675, pl. 51, figs. 19, 27.

Occurrence. — Sta. 4, Indian Ocean, Surface, 1 female.

Descriptive Notes. — Female. Length, 0.93 mm. The cephalothorax and abdomen are in the proportional lengths as 68 to 32. The 2nd thoracic segment has a slight dorsal hump. The wing-like expansion of the 4th thoracic segment extends about to the middle of genital segment. The abdominal segment and furca are in the proportional lengths as 60 to 40. The genital segment elongate ovate, about 2.3 times as long as broad, and about 3 times as long as high. The furcal rami 6 times as long as broad.

In the 1st to 3rd feet the 2nd and 3rd joints of the exopod are finely serrated. The specimen was ovigerous.

Remarks. — The present specimen is closely allied to *C. longicaudis* in having a dorsal hump on the 2nd thoracic segment, and long furcal rami which have the similar proportional length to the genital segment found in the GIESBRECHT's figure (pl. 51, fig. 19). But the ventral pad of the genital segment is smooth in *longicaudis*, whereas it is setose in the present specimen. The specimen is also allied to *C. brevis* FARRAN. But differs from it in the followings: the genital segment in dorsal view is not so broad as in *brevis*; the furcal rami are shorter in proportion to the genital segment in *brevis*.

Distribution. — *C. longicaudis* has been recorded from the tropical Atlantic by GIESBRECHT, and from the Ceylon Pearl Oyster Bank by THOMPSON and A. SCOTT.

95. *Corycaeus (Corycella) rostratus* CLAUS

(Plate XXXIX, Figs. 5-9)

Corycaeus rostratus, GIESBRECHT, 1892, p. 674, pl. 5, fig. 9, pl. 49, figs. 21, 28, 32, 33, pl. 51, figs. 16-18, 48, 52; M. DAHL, 1912, p. 111, pl. 14, figs. 22-25, pl. 15, figs. 17, 18, 26, 27.

Occurrence. — Sta. 5, Indian Ocean, Surface, 1 male.

Sta. 6, " " " " , 4 females, 17 males.

Sta. 7, " " " " , 23 females, 27 males.

Sta. 8, Off Cape of Good Hope, Surface, 45 females, 33 males.

Descriptive Notes. — Female. Length, 0.77-0.85 mm. The cephalothorax and abdomen are in the proportional lengths as 70 to 30. The abdominal segment and furca are in the proportional lengths as 73 to 27. The genital segment

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2 times as long as broad. The ventral pad setose. The furcal rami 3 times as long as broad.

Male. Length, 0.68–0.78 mm. The cephalothorax and abdomen are in the proportional lengths as 65 to 35. The abdominal segment and furca are in the proportional lengths as 75 to 25. The distal 1/3 of the genital segment is narrow, about half as broad as it is broad at the middle section. The furcal rami 3.5 times as long as broad.

Distribution. — In the subtropical and tropical Atlantic and the Mediterranean Sea. It is also sparingly distributed in the subtropical region of the North Pacific (TANAKA).

HARPACTICOIDA

Family ECTINOSOMIDAE

Genus *Microsetella* BRADY and ROBERTSON

96. *Microsetella norvegica* (BOECK)

Microsetella atlantica, GIESBRECHT, 1892, p. 550, pl. 44, figs. 34, 44, 45; *Microsetella norvegica*, FARRAN, 1929, p. 297; SEWELL, 1947, p. 289.

Occurrence. — Sta. 1, South China Sea, Surface, 1 female.

Sta. 1, Indian Ocean, Surface, 1 female.

Sta. 5, " , " , 1 female.

Female. Length, 0.50–0.61 mm.

Distribution. — The species is widely distributed in the oceans, and also in the Arctic.

97. *Microsetella rosea* DANA

Microsetella rosea, GIESBRECHT, 1892, p. 550, pl. 44, figs. 32, 35, 38, 41, 43, 48, 49; FARRAN, 1929, p. 297; MORI, 1937, p. 116, pl. 64, figs. 6–8; SEWELL, 1947, p. 289; VERVOORT, 1957, p. 148.

Occurrence. — Sta. 1, South China Sea, Surface, 3 females, 1 male.

Sta. 2, Indian Ocean, Surface, 63 females, 2 males.

Sta. 3, " , " , 3 females.

Sta. 4, " , " , 3 females.

Sta. 5, " , " , 7 females.

Sta. 6, " , " , 2 females.

Sta. 7, " , " , 1 female.

Sta. 8, Off Cape of Good Hope, Surface, 3 females, 3 males.

Sta. 10, Antarctic, Surface, 1 female.

Sta. 17, " , 250–0 m., 1 female.

Female. Length, 0.36–0.59 mm. Male. Length, 0.37–0.51 mm.

Remarks. — *Macrosetella rosea* varies considerably in size. FARRAN's specimens from the tropical Atlantic measured 0.57 mm., those from the New Zealand 0.84–0.94 mm. The specimens from the Japanese waters measured 0.64–0.85 mm in the female. A single female specimen from the Station 17 (67°03'S) may be a dead specimen.

Distribution. — The species is widely distributed in the three great oceans. FARRAN recorded the occurrence of the species as far south as 40°12'S. VERVOORT found a single specimen from 48°23'S, 146°29.5'E.

Family MACROSETELLIDAE

Genus *Macrosetella* A. SCOTT

98. *Macrosetella gracilis* (DANA)

Setella gracilis, GIESBRECHT, 1892, p. 559, pl. 50, figs. 1–10; *Macrosetella gracilis*, A. SCOTT, 1909, p. 230; *Setella gracilis*, FARRAN, 1929, p. 298; MORI, 1937, p. 115, pl. 64, figs. 1–5; *Macrosetella gracilis*, SEWELL, 1947, p. 290.

Occurrence. — Sta. 2, Indian Ocean, Surface, 1 male.

Sta. 5, " , " , 1 male.

Sta. 6, " , " , 6 females, 20 males.

Sta. 7, " , " , 2 females, 5 males, 8 juvs.

Sta. 8, Off Cape of Good Hope, Surface, 1 female.

Female. Length, 0.94–1.57 mm. Male. Length, 0.94–1.25 mm.

Distribution. — The species is widely distributed in the tropical and temperate regions of the three great oceans.

Family TACHIDIIDAE

Genus *Euterpina* NORMAN

99. *Euterpina acutifrons* (DANA)

Euterpe acutifrons, GIESBRECHT, 1892, p. 555, pl. 44, figs. 16–31; MORI, 1937, p. 117, pl. 64, figs. 11–13, pl. 65, figs. 1–5; *Euterpina acutifrons*, SEWELL, 1947, p. 290.

Occurrence. — Sta. 8, Off Cape of Good Hope, Surface, 8 females, 9 males.

Female. Length, 0.57–0.76 mm. Male. Length, 0.47–0.67 mm.

Distribution. — Widely distributed in the tropical and temperate regions of the oceans.

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Family TISBIDAE

Genus *Tisbe* LILLJEBORG

100. *Tisbe racovitzai* (GIESBRECHT)

(Plate XL, Figs. 1-11)

Idya racovitzai, GIESBRECHT, 1902, p. 38, pl. 11, figs. 1-7; FARRAN, 1929, p. 299.

Occurrence.—Sta. 13, Antarctic, 50–0 m, 1 female.

Sta. 14, „, 200–0 m, 1 female, 1 immature female.

Descriptive Notes.—Female. Length, 0.535 mm. The anterior and posterior regions of the body are in the proportional lengths as 65 to 35. The head fused with the 1st thoracic segment. The anterior region about 1.6 times as long as broad. The posterior region rectangular in shape, and has the segments and furca in the following proportional lengths:

Segment	Th. 5	Abd. 1-2	3	4	5	Furca
	10	21	19	8	16	26 = 100.

The furcal rami broad, about 2 times as long as it is broad at the distal part. The 2nd inner seta of the furca is the longest. The 2nd to anal segment are striated with fine teeth on the posterior border of the segment when viewed from the ventral.

The 1st antenna 8-jointed. The joints are in the following proportional lengths:

Joint	1	2	3	4	5	6	7	8
	15	22	18	15	7	8	5	10 = 100.

The joints 6 and 7 are fused anteriorly.

In the 2nd antenna the exopod is 5-jointed. The 2nd, 3rd, and 4th joints have each a seta. The distal joint have 3 setae of which the outer marginal one is very short. The endopod consists of 2 joints. The distal joint has a spine and 4 flexible setae distally, and 2 strong spines on the inner margin about the middle of the joint. The mandible has 2-jointed exopod and endopod. The biting part has 6 teeth, a seta, and a small projection. In the 2nd maxilla the terminal claw is stout and bears a slender seta near the middle of the claw.

The 1st foot has 3-jointed exopod and endopod. The 1st joint of the exopod has a long outer marginal spine. The distal joint has 3 strong spines on the outer margin and 2 setae distally. The endopod is elongated. The 1st joint is the longest, bears a seta on the inner distal margin. The 2nd joint is short,

bears a seta on the inner margin about in the middle of the joint. The 3rd joint is the shortest, quadrate in form, bears 2 apical spines of which the inner one is strong. The 2nd basal joint has a strong spine on the outer margin and a shorter spine on the anterior surface near the base of the endopod.

The 2nd and to 4th feet have each 3-jointed exopod and endopod. The 3rd joint of the exopod has each 3 outer marginal spines, a long terminal spine and 4 inner marginal setae. The 3rd joint of the endopod has a spine and a seta on the distal margin, and 3 inner marginal setae.

The 5th foot 2-jointed. The distal joint quadrate in shape, bears 4 distal setae and a small outer marginal one. The inner expansion of the basal joint has 2 apical setae. The outer expansion bears a seta.

Remarks. — The present specimen comes nearest to *Tisbe racovitzai* (GIESBRECHT), differing only in its small size and in the 3-jointed endopod of the 1st swimming foot. GIESBRECHT's specimen measured 0.75–0.80 mm. FARRAN's measured 0.54–0.66 mm.

Distribution. — The species has been recorded from the Antarctic; 70°–71°S (GIESBRECHT), 60°–66°S (FARRAN).

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VI. ILLUSTRATIONS

(PLATES I—XL)

PLATE I

Calanus propinquus BRADY

Female.

- Fig. 1. Dorsal view. $\times 19$
- Fig. 2. Head, lateral view. $\times 33$
- Fig. 3. Genital segment, ventral view. $\times 67$
- Fig. 4. Last thoracic segment and abdomen, lateral view. $\times 67$
- Fig. 5. 1st foot. $\times 67$
- Fig. 6. 2nd foot. $\times 67$
- Fig. 7. 5th foot. $\times 67$
- Fig. 8. Inner margin of 1st basal joint of 5th foot. $\times 270$

PLATE I

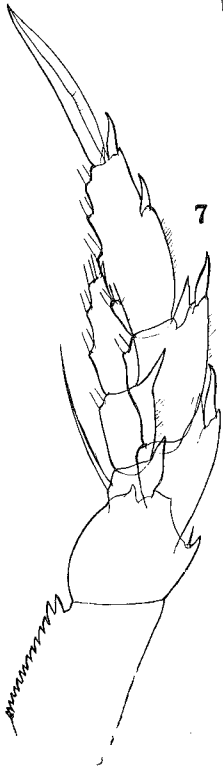
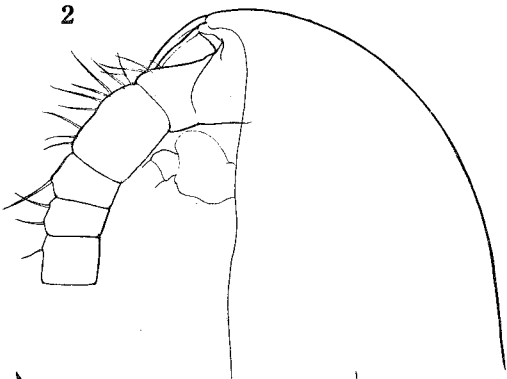
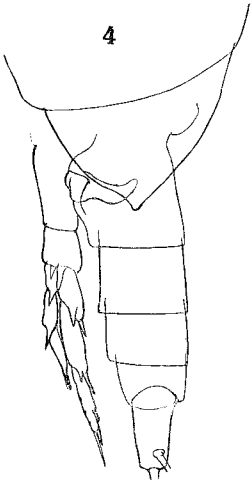
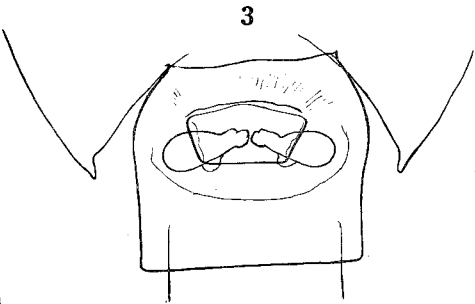
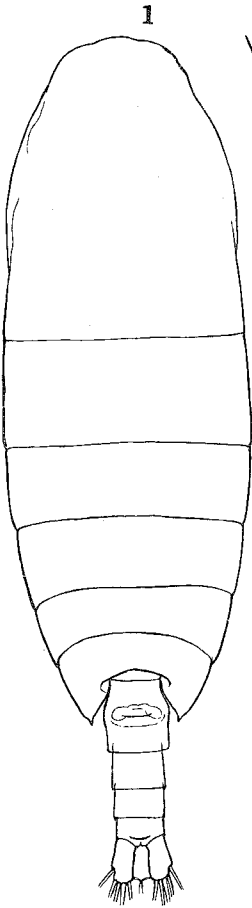


PLATE II

Calanus propinquus BRADY (Figs. 1-2)

Female.

Fig. 1. 1st antenna with regenerated setae. $\times 67$

Immature female.

Fig. 2. Inner margin of 1st basal joint of 5th foot. $\times 267$

Calanus simillimus GIESBRECHT (Figs. 3-10)

Female.

Fig. 3. Head, lateral view. $\times 67$

Fig. 4. Last thoracic segment and abdomen, ventral view. $\times 67$

Fig. 5. Last thoracic segment and abdomen, lateral view. $\times 67$

Fig. 6. Inner margin of 1st basal joint of 5th foot. $\times 267$

Fig. 7. Genital segment, ventral view. $\times 67$

Male.

Fig. 8. Head, lateral view. $\times 67$

Fig. 9. Last thoracic segment and abdomen, lateral view. $\times 67$

Fig. 10. 1st basal joints of 5th feet. $\times 133$

PLATE II

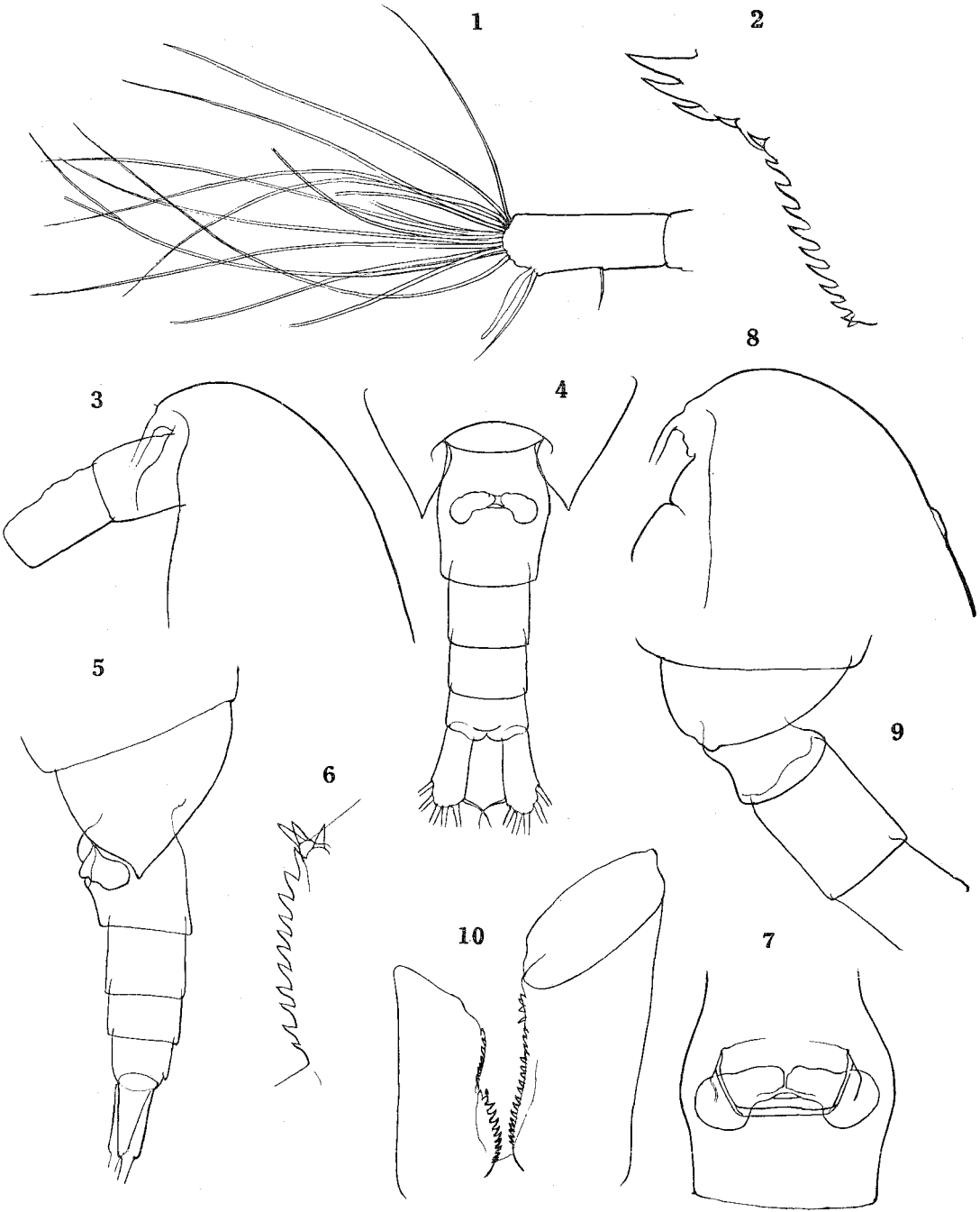


PLATE III

Calanoides acutus (GIESBRECHT) (Figs. 1-9)

Female.

- Fig. 1. Dorsal view. $\times 19$
- Fig. 2. Head, lateral view. $\times 47$
- Fig. 3. Last thoracic segment and abdomen, lateral view. $\times 47$
- Fig. 4. Genital segment, ventral view. $\times 67$
- Fig. 5. Genital segment, ventral view. $\times 67$
- Fig. 6. 2nd foot. $\times 67$
- Fig. 7. 4th foot. $\times 67$
- Fig. 8. 5th foot. $\times 67$
- Fig. 9. Head, dorsal view, other specimen (4.57 mm). $\times 27$

PLATE III

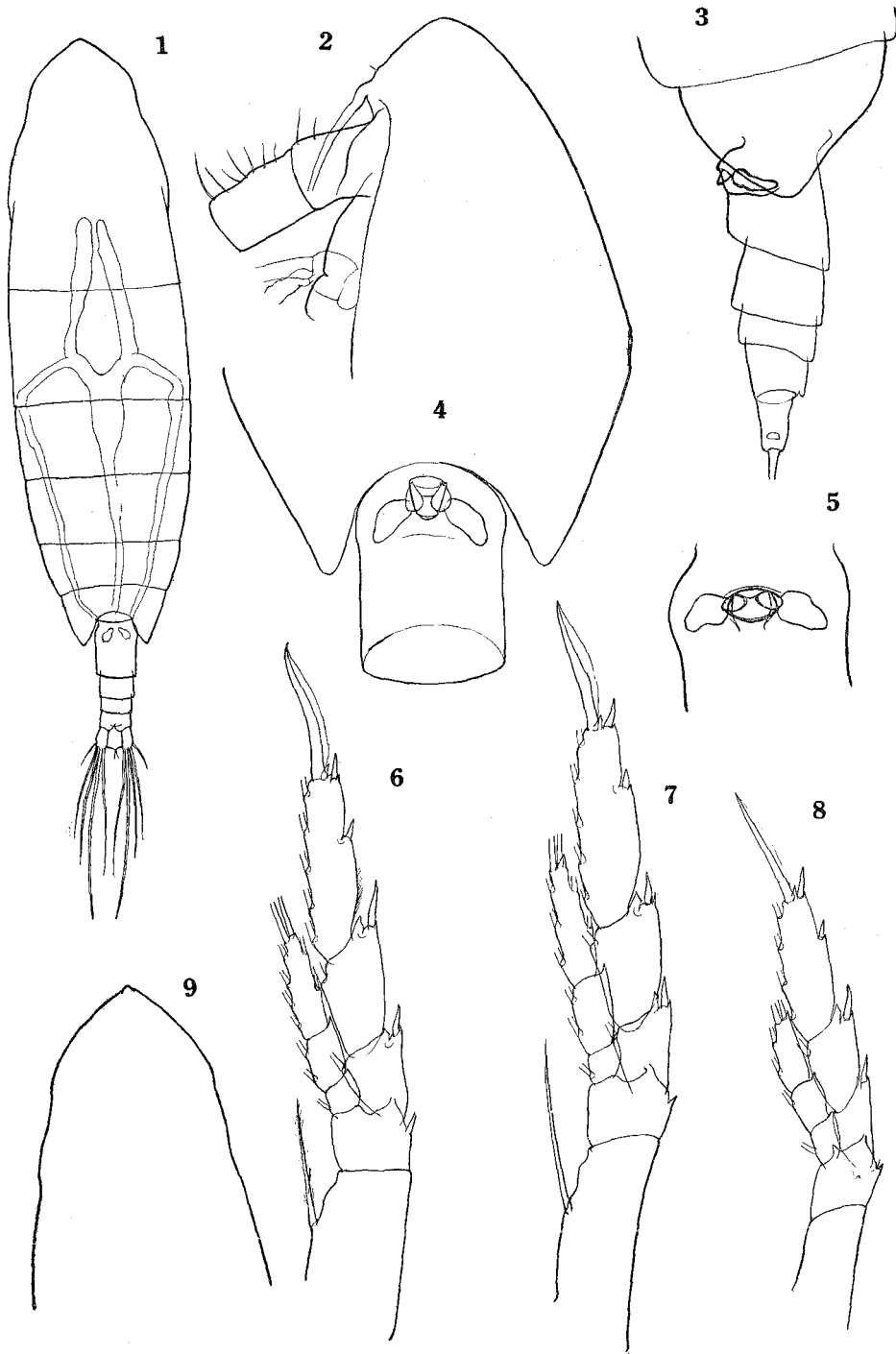


PLATE IV

Calanoides carinatus (KRÖYER) (Figs. 1-9)

Female.

- Fig. 1. Dorsal view. ×19
- Fig. 2. Head, lateral view. ×47
- Fig. 3. Last thoracic segment and abdomen, lateral view. ×47
- Fig. 4. Genital segment, ventral view. ×67
- Fig. 5. 1st foot. ×67
- Fig. 6. 2nd foot. ×67
- Fig. 7. 4th foot. ×67
- Fig. 8. 5th foot. ×67

Immature female.

- Fig. 9. Last thoracic segment and abdomen. ×47

PLATE IV

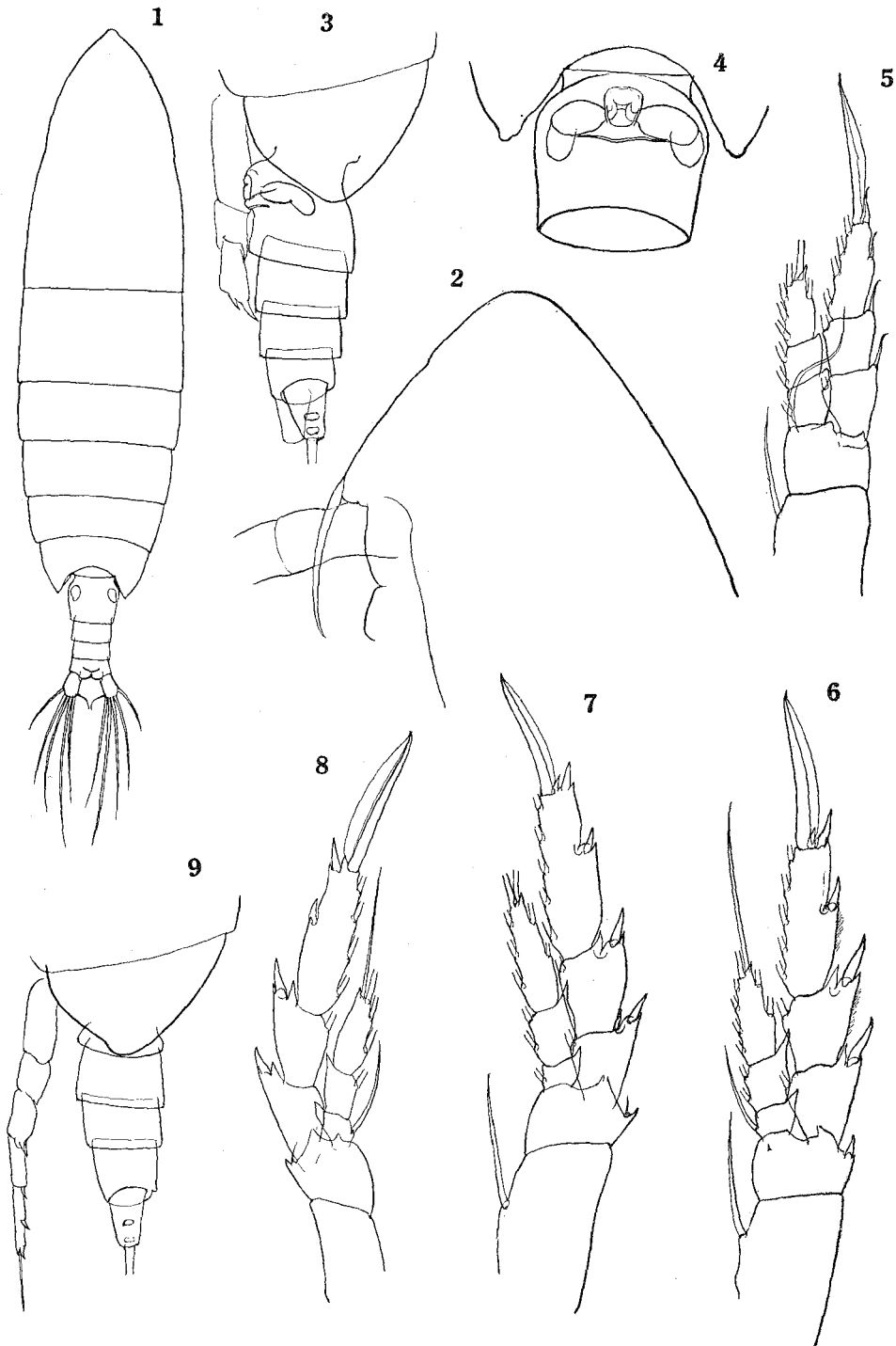


PLATE V

Rhincalanus gigas BRADY (Figs. 1-6)

Female.

- Fig. 1. Head, lateral view. $\times 27$
- Fig. 2. Head, dorsal view. $\times 27$
- Fig. 3. Last thoracic segment and abdomen, lateral view. $\times 27$

Immature male.

- Fig. 4. Last thoracic segment and abdomen, lateral view. $\times 27$
- Fig. 5. Last thoracic segment and abdomen, dorsal view. $\times 27$
- Fig. 6. 5th foot. $\times 133$

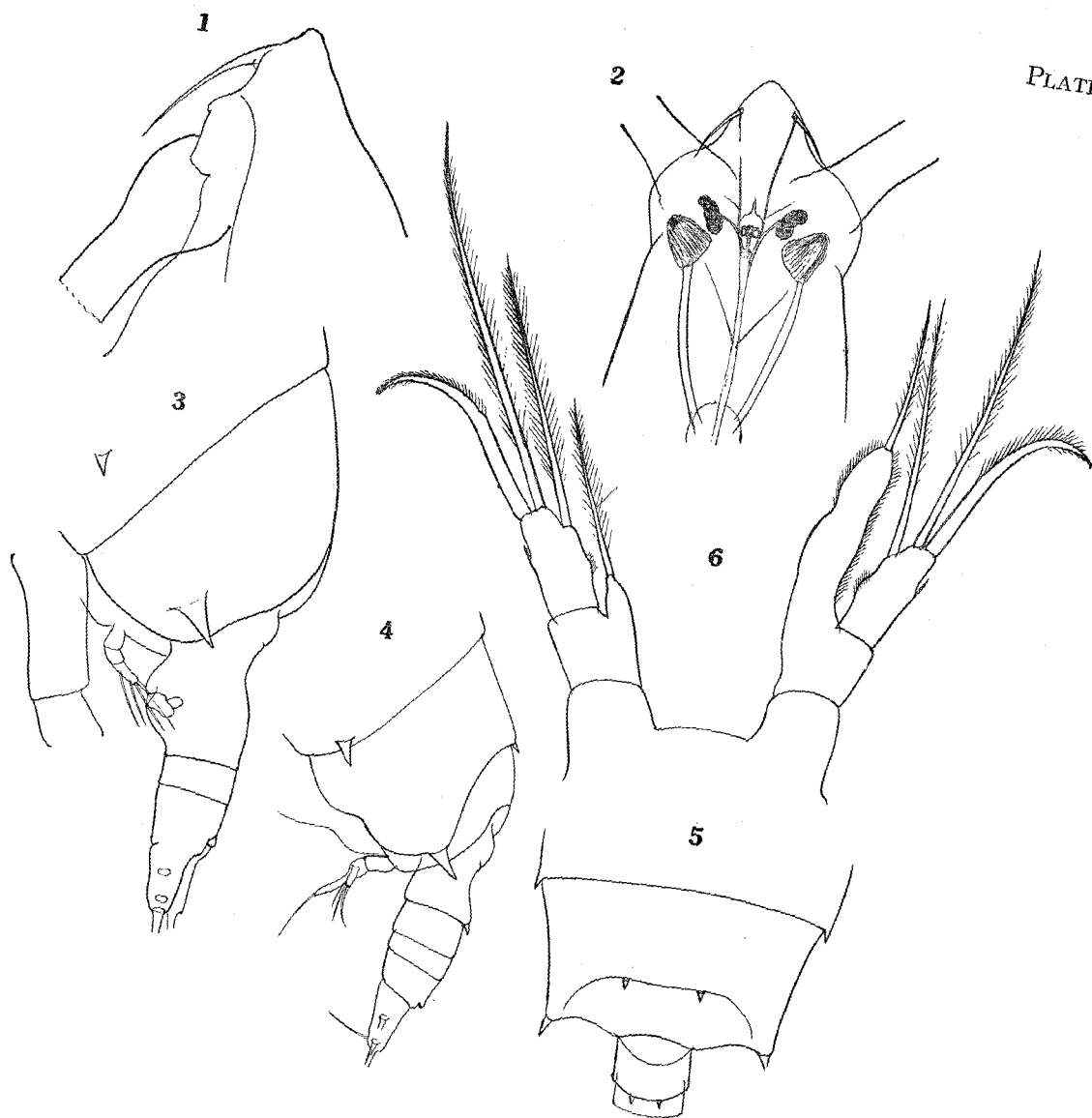


PLATE VI

Paracalanus crassirostris DAHL (Figs. 1-7)

Female.

- Fig. 1. Dorsal view. $\times 200$
- Fig. 2. Head, lateral view. $\times 200$
- Fig. 3. Thoracic segments and abdomen, lateral view. $\times 200$
- Fig. 4. 1st foot. $\times 400$
- Fig. 5. 2nd foot. $\times 400$
- Fig. 6. 4th foot. $\times 400$
- Fig. 7. 5th foot. $\times 400$

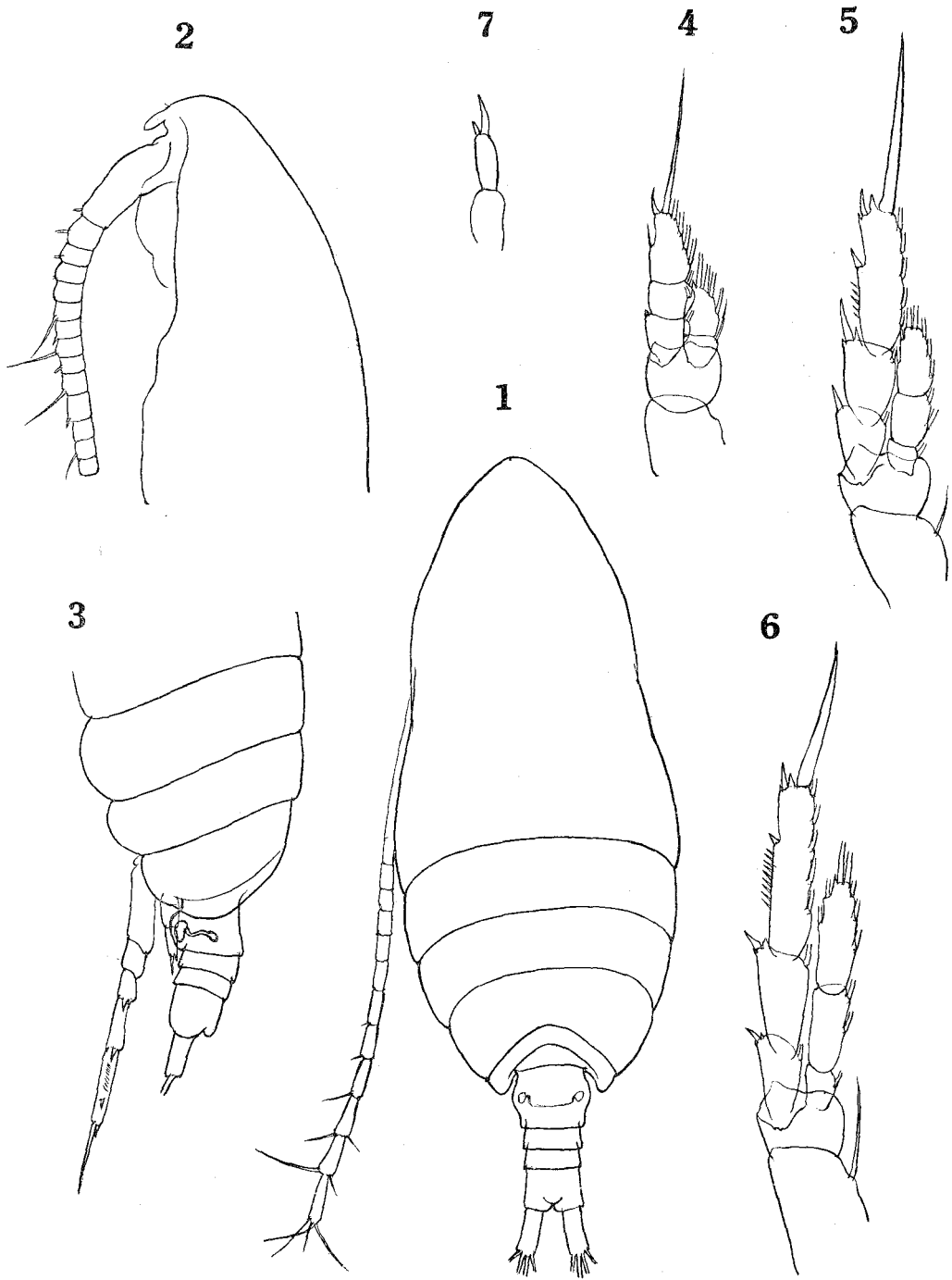


PLATE VII

Paracalanus nanus G. O. Sars (Figs. 1-11)

Female.

- Fig. 1. Lateral view. $\times 133$
- Fig. 2. Head, dorsal view. $\times 133$
- Fig. 3. Abdomen, dorsal view. $\times 267$
- Fig. 4. Genital segment, ventral view. $\times 267$
- Fig. 5. 1st foot. $\times 267$
- Fig. 6. 2nd foot. $\times 267$
- Fig. 7. 3rd foot. $\times 267$
- Fig. 8. 4th foot. $\times 267$
- Fig. 9. 5th foot. $\times 267$

Male.

- Fig. 10. Last thoracic segment and abdomen, lateral view. $\times 267$

Immature male.

- Fig. 11. Last thoracic segment and abdomen, lateral view. $\times 267$

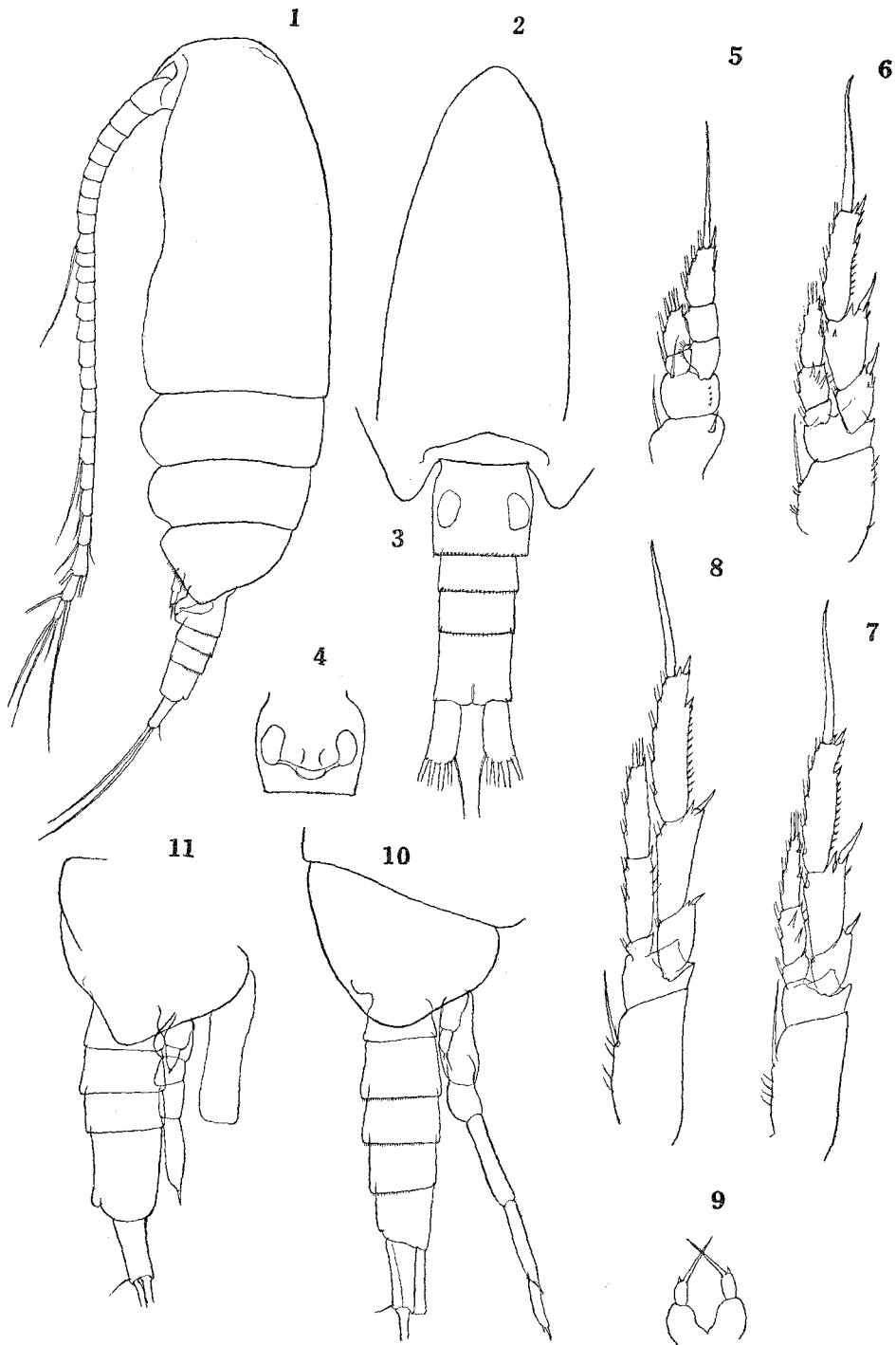


PLATE VIII

Paracalanus nudus SEWELL (Figs. 1-8)

Female.

- Fig. 1. Dorsal view. $\times 133$
- Fig. 2. Lateral view. $\times 133$
- Fig. 3. Genital segment, ventral view. $\times 267$
- Fig. 4. 1st foot. $\times 267$
- Fig. 5. 2nd foot. $\times 267$
- Fig. 6. 3rd foot. $\times 267$
- Fig. 7. 4th foot. $\times 267$
- Fig. 8. 5th foot. $\times 267$

Paracalanus nanus G. O. SARS (Fig. 9)

Male.

- Fig. 9. Lateral view. $\times 133$

PLATE VIII

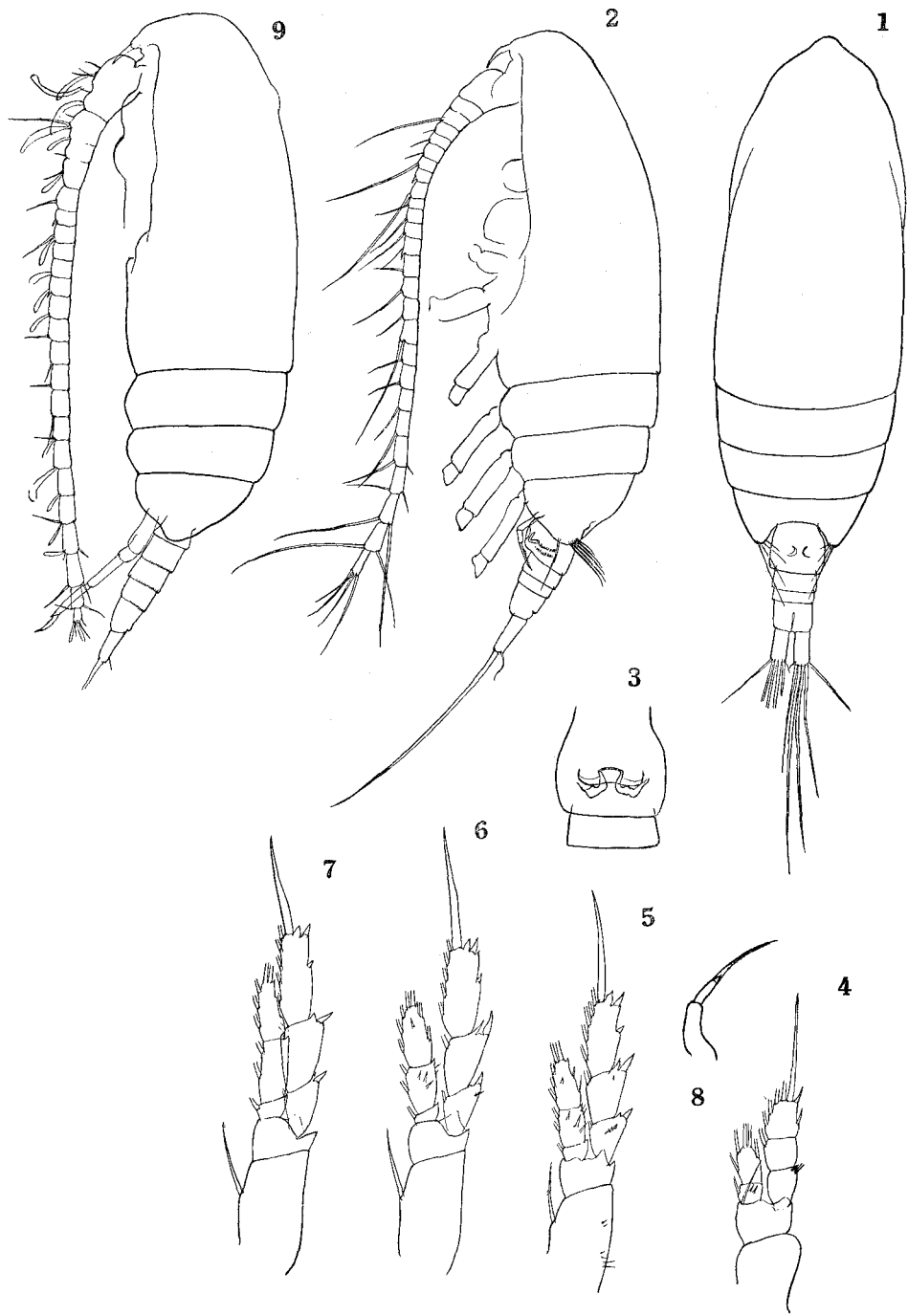


PLATE IX

Acrocalanus gracilis GIESBRECHT (Figs. 1-4)

Female.

- Fig. 1. Lateral view. $\times 67$
- Fig. 2. 2nd foot. $\times 133$
- Fig. 3. 3rd foot. $\times 133$
- Fig. 4. Abnormal left 5th foot. $\times 267$

Acrocalanus indicus sp. nov. (Figs. 5-9)

Male.

- Fig. 5. Dorsal view. $\times 133$
- Fig. 6. Lateral view. $\times 133$
- Fig. 7. 1st, foot. $\times 267$
- Fig. 8. 2nd foot. $\times 267$
- Fig. 9. Left 5th foot. $\times 267$

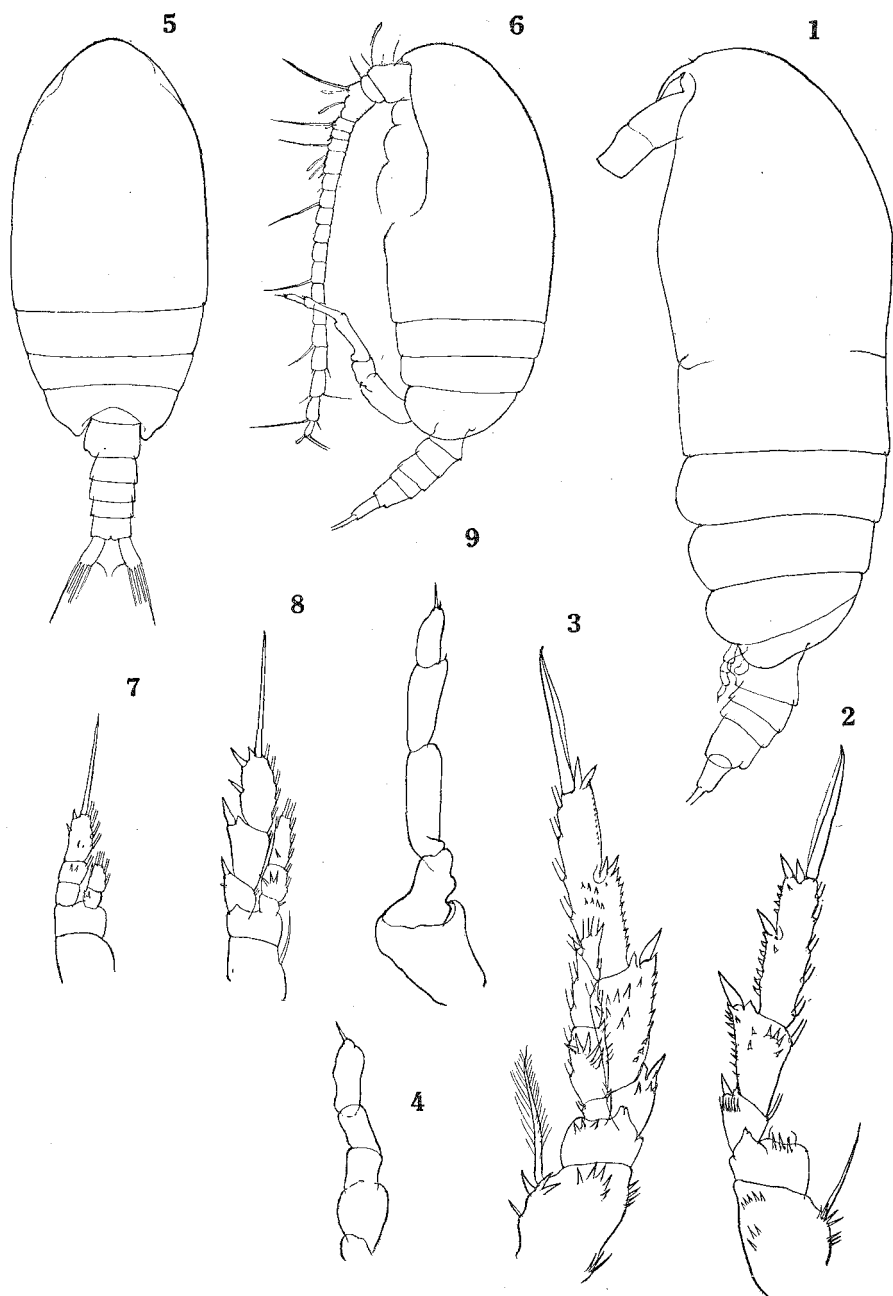


PLATE X

Clausocalanus arcuicornis (DANA) (Figs. 1-9)

Female specimen from Station 8, 1.47 mm.

Fig. 1. Head, lateral view. $\times 133$

Fig. 2. Last thoracic segment and genital segment. $\times 133$

Female specimen from Station 5, 1.30 mm.

Fig. 3. Head, lateral view. $\times 133$

Fig. 4. Last thoracic segment and genital segment. $\times 133$

Female specimen from Station 5, 1.31 mm.

Fig. 5. Head, lateral view. $\times 133$

Fig. 6. Last thoracic segment and genital segment, ventral view.
 $\times 133$

Female specimen from Station 5, 1.12 mm.

Fig. 7. Head, lateral view. $\times 133$

Fig. 8. Last thoracic segment and genital segment, lateral view.
 $\times 133$

Female specimen with asymmetrical 5th feet, 1.30 mm.

Fig. 9. Last thoracic segment and genital segment, ventral view.
 $\times 133$

PLATE X

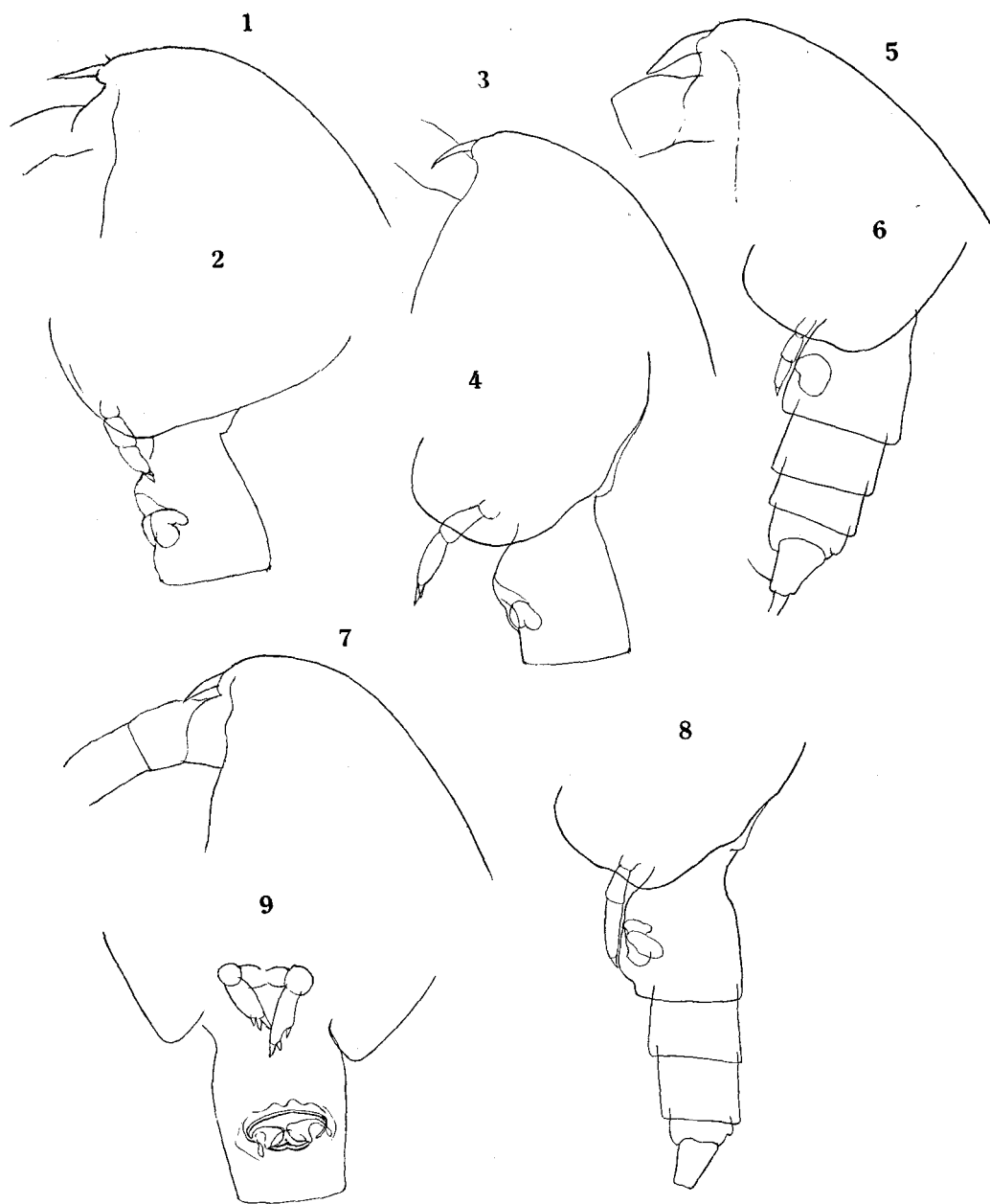


PLATE XI

Clausocalanus laticeps FARRAN (Figs. 1-14)

Female.

- Fig. 1. Head, dorsal view. $\times 67$
- Fig. 2. Head, lateral view. $\times 67$
- Fig. 3. Abdomen, dorsal view. $\times 67$
- Fig. 4. Abdomen, lateral view. $\times 67$
- Fig. 5. Genital segment, ventral view. $\times 133$
- Fig. 6. 2nd foot. $\times 133$
- Fig. 7. 3rd foot. $\times 133$
- Fig. 8. 5th feet. $\times 133$

Male.

- Fig. 9. Lateral view. $\times 67$
- Fig. 10. 2nd foot. $\times 133$
- Fig. 11. Distal joint of left 5th foot. $\times 267$
- Fig. 12. Right 5th foot. $\times 267$

Immature female.

- Fig. 13. Last thoracic segment and abdomen, lateral view. $\times 133$
- Fig. 14. 2nd foot. $\times 267$

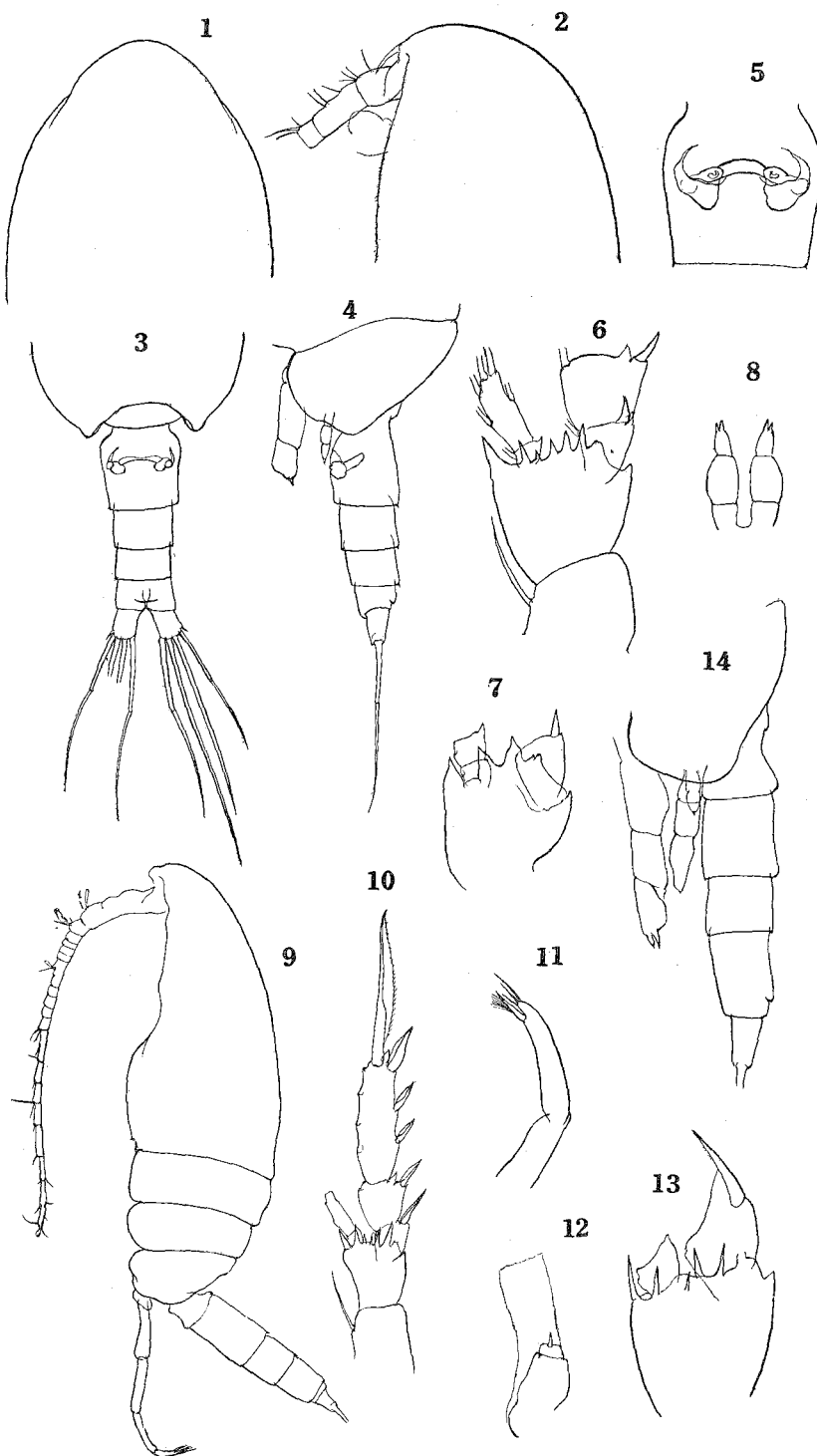


PLATE XII

Clausocalanus paululus FARRAN (Figs. 1-5)

Female.

- Fig. 1. Lateral view. $\times 133$
- Fig. 2. Abdomen, dorsal view. $\times 133$
- Fig. 3. Basal joints of 2nd foot. $\times 267$
- Fig. 4. Basal joints of 3rd foot. $\times 267$
- Fig. 5. 5th feet, $\times 267$.

Clausocalanus pergens FARRAN (Figs. 6-10)

Male.

- Fig. 6. Head, lateral view. $\times 200$ 133
- Fig. 7. 2nd basal joint of 2nd foot. $\times 267$
- Fig. 8. 2nd basal joint of 3rd foot. $\times 267$
- Fig. 9. 5th feet. $\times 267$

Female.

- Fig. 10. 2nd basal joint of 2nd foot. $\times 267$

PLATE XII

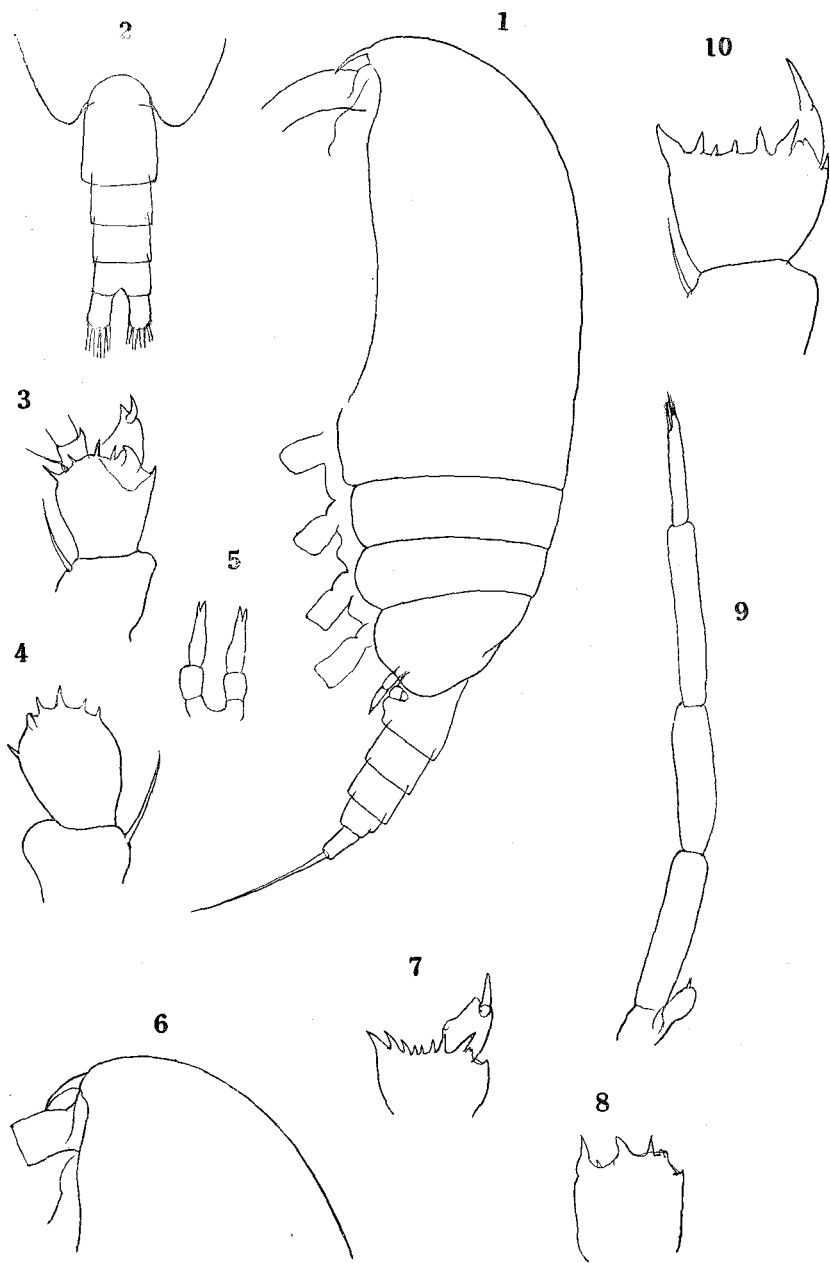


PLATE XIII

Microcalanus pygmaeus G. O. Sars (Figs. 1-9)

Female.

- Fig. 1. Head, dorsal view. $\times 133$
- Fig. 2. 2nd foot. $\times 267$
- Fig. 3. 3rd foot. $\times 267$
- Fig. 4. Head, lateral view, other specimen. $\times 133$

Male.

- Fig. 5. Dorsal view. $\times 93$
- Fig. 6. Head, lateral view. $\times 133$
- Fig. 7. Abdomen, lateral view. $\times 133$
- Fig. 8. 5th feet. $\times 267$

Immature male.

- Fig. 9. 5th feet. $\times 267$

PLATE XIII

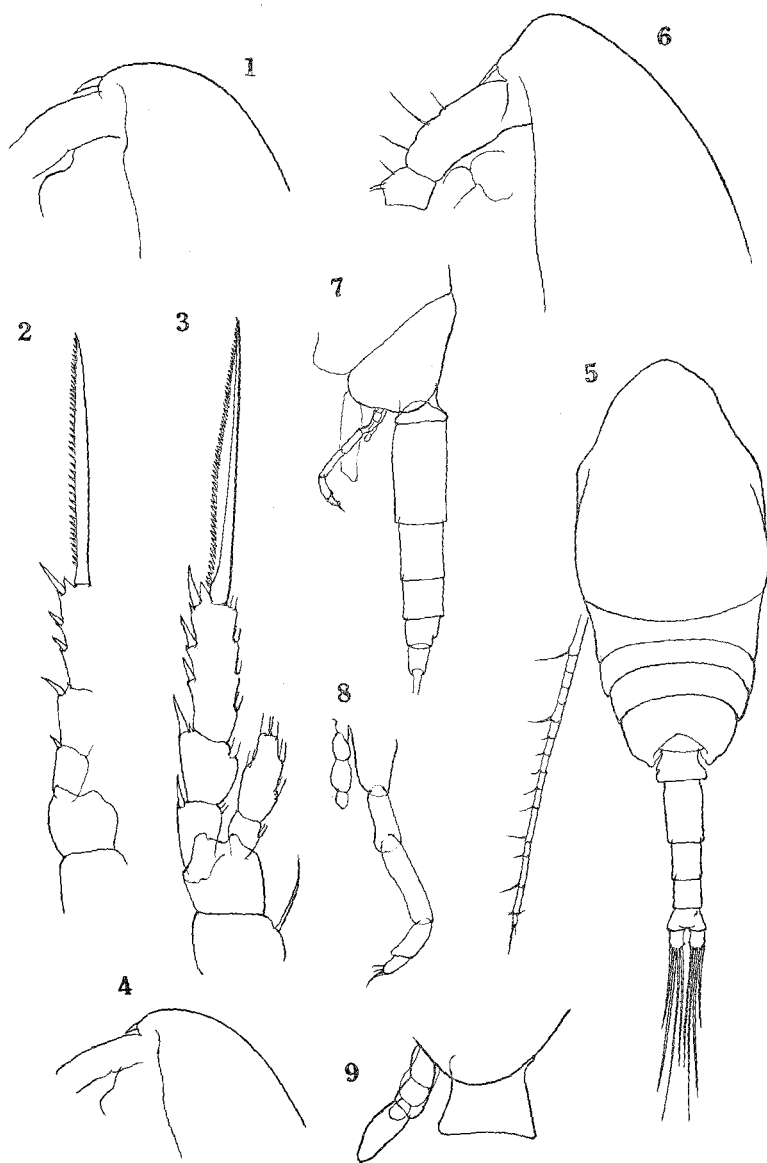


PLATE XIV

Stephus longipes GIESBRECHT (Figs. 1-10)

Male.

- Fig. 1. Lateral view. $\times 93$
- Fig. 2. Dorsal view. $\times 93$
- Fig. 3. Furcal rami. $\times 267$
- Fig. 4. 2nd foot. $\times 267$
- Fig. 5. Right 5th foot. $\times 267$
- Fig. 6. Left 5th foot. $\times 267$

Immature female.

- Fig. 7. Lateral view. $\times 93$
- Fig. 8. Abdomen, dorsal view. $\times 133$
- Fig. 9. 1st foot. $\times 267$
- Fig. 10. 3rd foot. $\times 267$

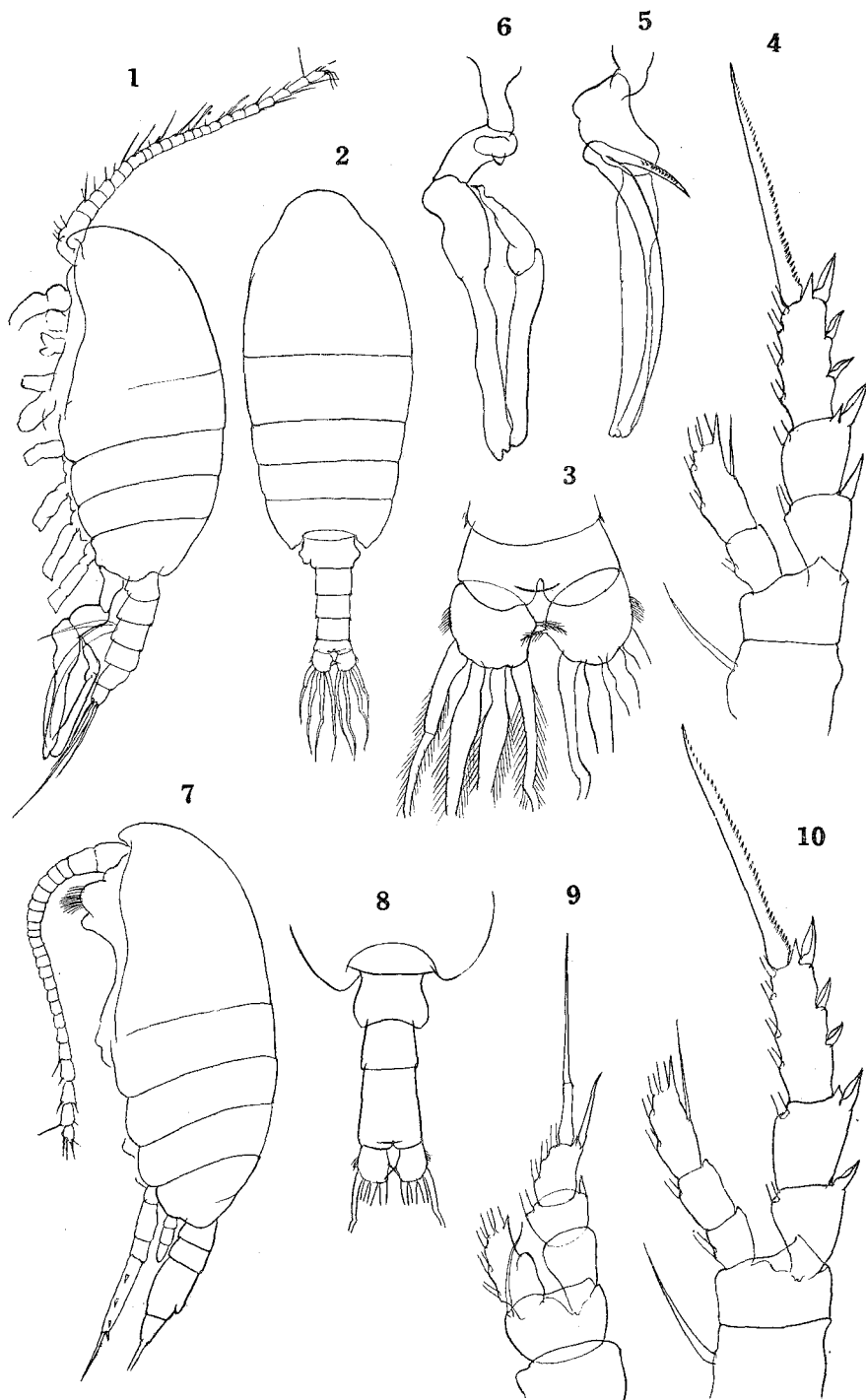


PLATE XV

Euchirella sp. (Figs. 1-5)

Immature female.

- Fig. 1. Head, lateral view. $\times 47$
- Fig. 2. Thoracic segments and abdomen, lateral view. $\times 47$
- Fig. 3. 1st maxilla. $\times 67$
- Fig. 4. 1st foot. $\times 67$
- Fig. 5. 2nd foot. $\times 67$

Pareuchaeta sp. (Figs. 6-9)

Immature female.

- Fig. 6. Dorsal view. $\times 27$
- Fig. 7. Head, lateral view. $\times 47$
- Fig. 8. Last thoracic segment and abdomen. $\times 47$
- Fig. 9. 1st foot. $\times 67$

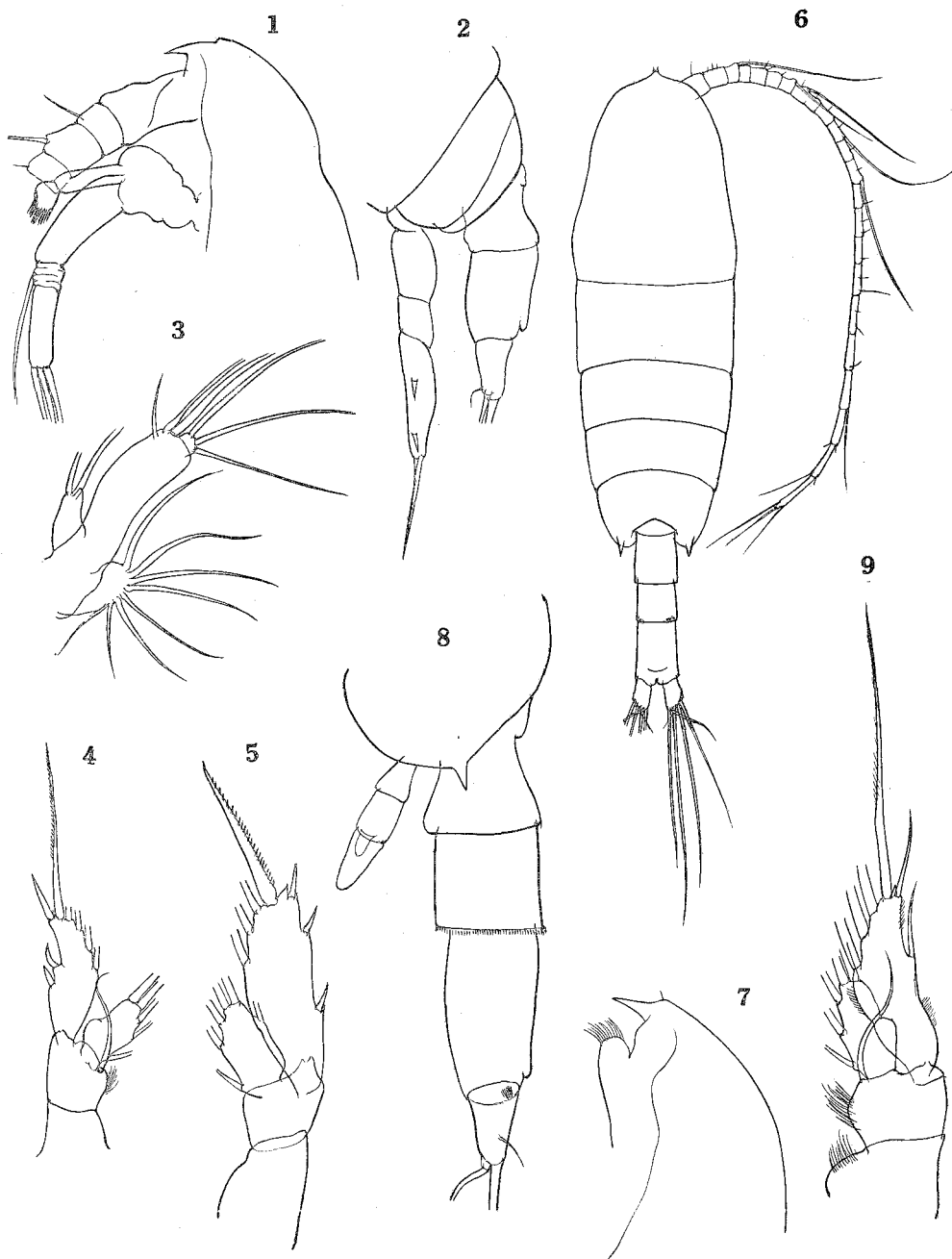


PLATE XVI

Scolecithricella glacialis GIESBRECHT (Figs. 1-8)

Female.

- Fig. 1. Dorsal view. $\times 67$
- Fig. 2. Lateral view. $\times 67$
- Fig. 3. 1st foot. $\times 133$
- Fig. 4. 2nd foot. $\times 133$
- Fig. 5. 3rd foot. $\times 133$
- Fig. 6. 4th foot. $\times 133$
- Fig. 7. 5th foot. $\times 267$

Immature male.

- Fig. 8. 5th feet. $\times 267$

PLATE XVI

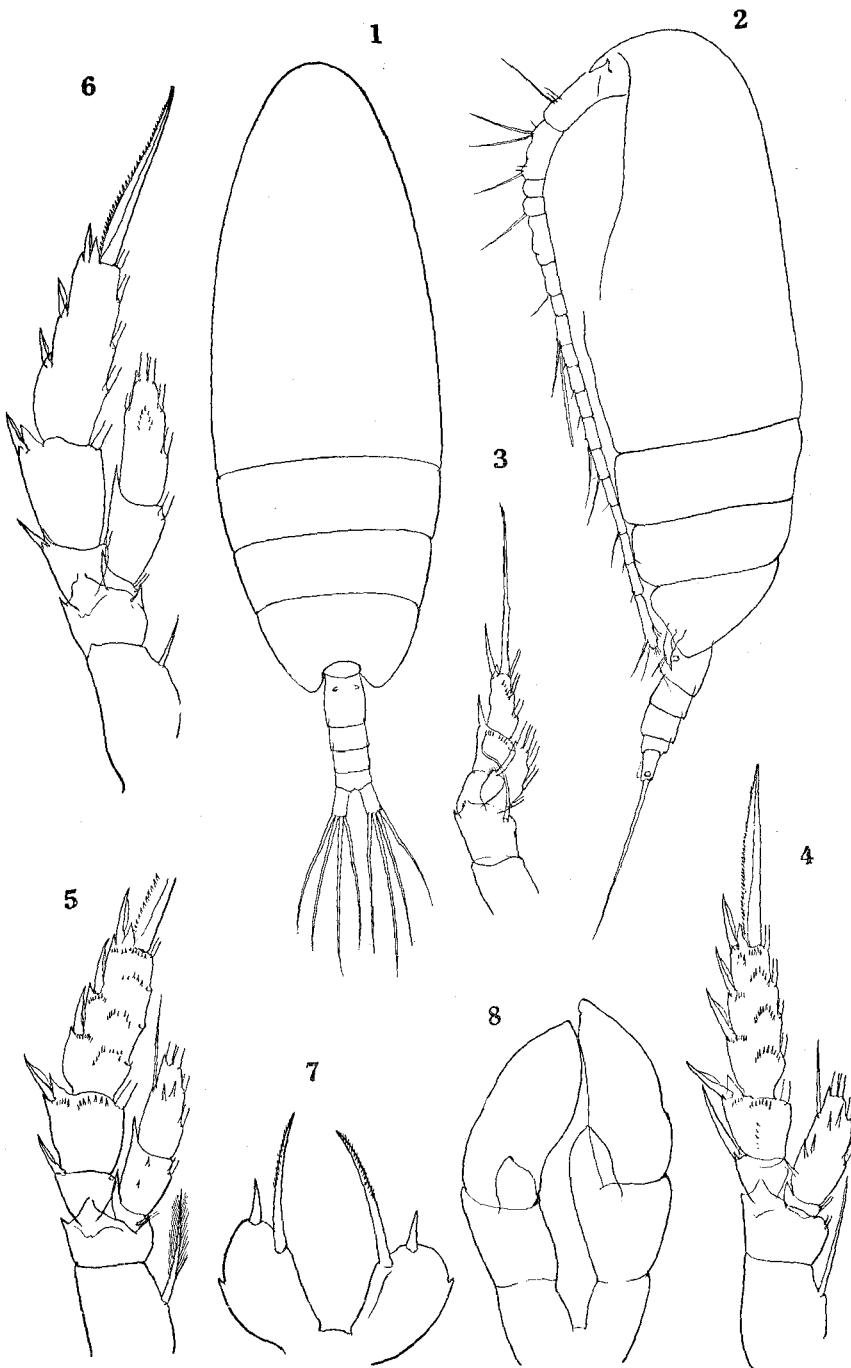


PLATE XVII

Racovitzanus antarcticus GIESBRECHT (Figs. 1-7)

Female.

- Fig. 1. Dorsal view. $\times 33$
- Fig. 2. Head, lateral view. $\times 67$
- Fig. 3. Last thoracic segment and abdomen, lateral view. $\times 67$
- Fig. 4. Furcal rami, dorsal view. $\times 67$
- Fig. 5. 1st foot. $\times 133$
- Fig. 6. 2nd foot. $\times 133$

Immature male.

- Fig. 7. Last thoracic segment and abdomen, lateral view. $\times 67$

PLATE XVII

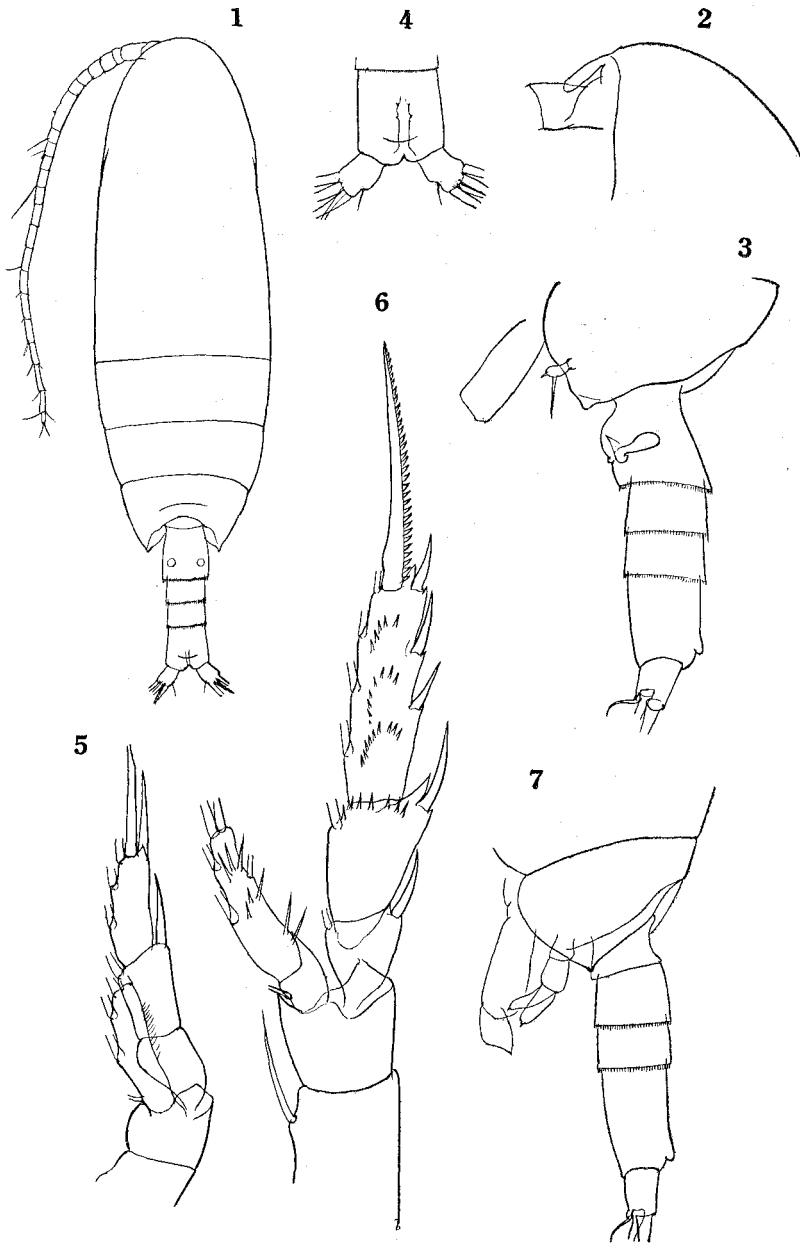


PLATE XVIII

Scaphocalanus brevicornis G. O. Sars (Figs. 1-6)

Female.

- Fig. 1. Dorsal view. $\times 27$
- Fig. 2. Head, lateral view. $\times 67$
- Fig. 3. Last thoracic segment and abdomen, lateral view. $\times 67$
- Fig. 4. 1st foot. $\times 133$
- Fig. 5. 2nd foot. $\times 133$
- Fig. 6. 5th foot. $\times 133$

PLATE XVIII

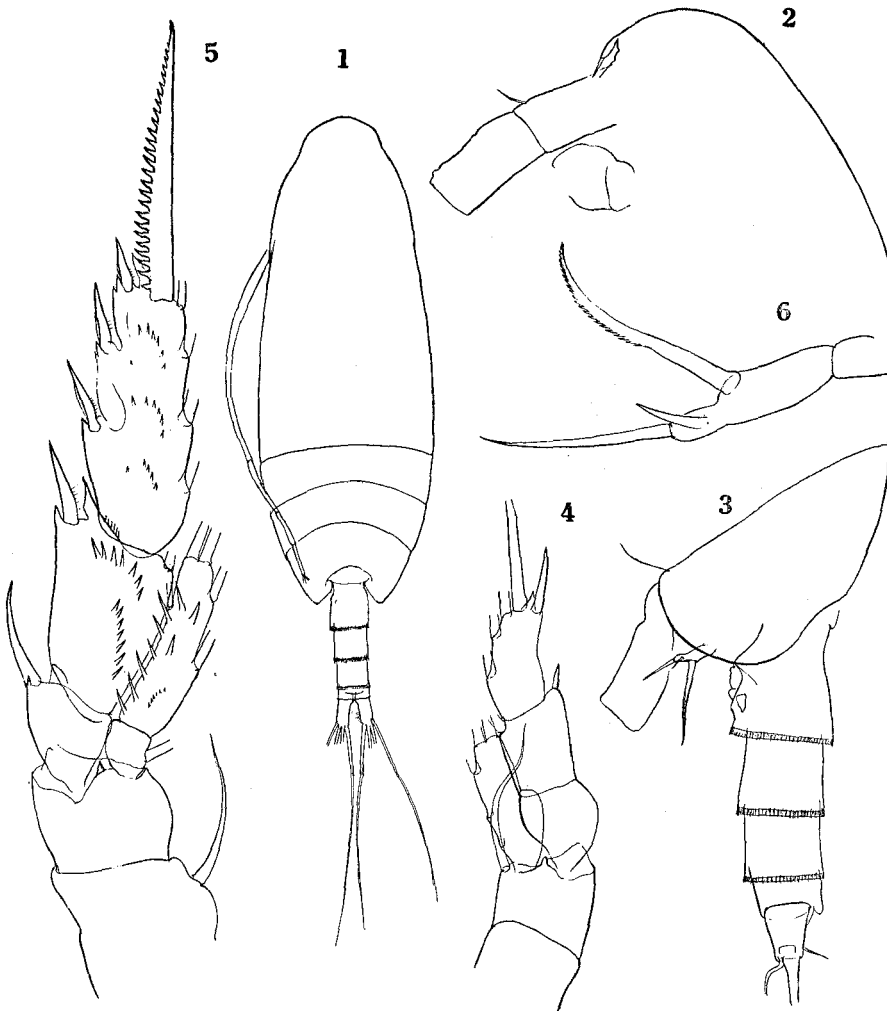


PLATE XIX

Scaphocalanus subbrevicornis WOLFENDEN (Figs. 1-8)

Female.

- Fig. 1. Head, lateral view. $\times 67$
Fig. 2. Last thoracic segment and abdomen, lateral view. $\times 133$
Fig. 3. 2nd foot with two joints of exopod, lateral view. $\times 267$
Fig. 4. 5th foot. $\times 133$.

Immature male.

- Fig. 5. Last thoracic segment and abdomen, lateral view. $\times 67$
Fig. 6. 1st foot. $\times 133$
Fig. 7. 2nd foot. $\times 133$
Fig. 8. 5th foot. $\times 133$

PLATE XIX

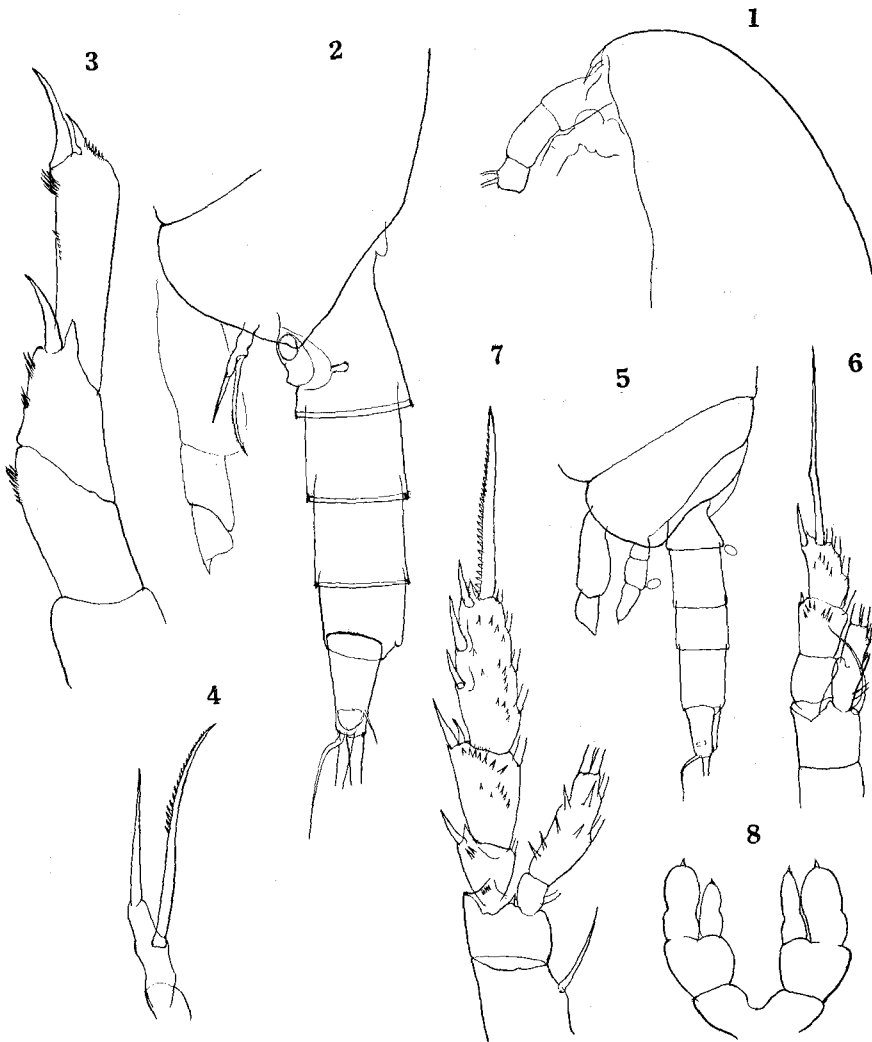


PLATE XX

Centropages typicus KRÖYER (Figs. 1-5)

Female.

Fig. 1. Dorsal view. ×33

Fig. 2. Lateral view. ×33

Fig. 3. 5th foot. ×133

Male.

Fig. 4. Dorsal view. ×33

Fig. 5. 5th feet. ×133

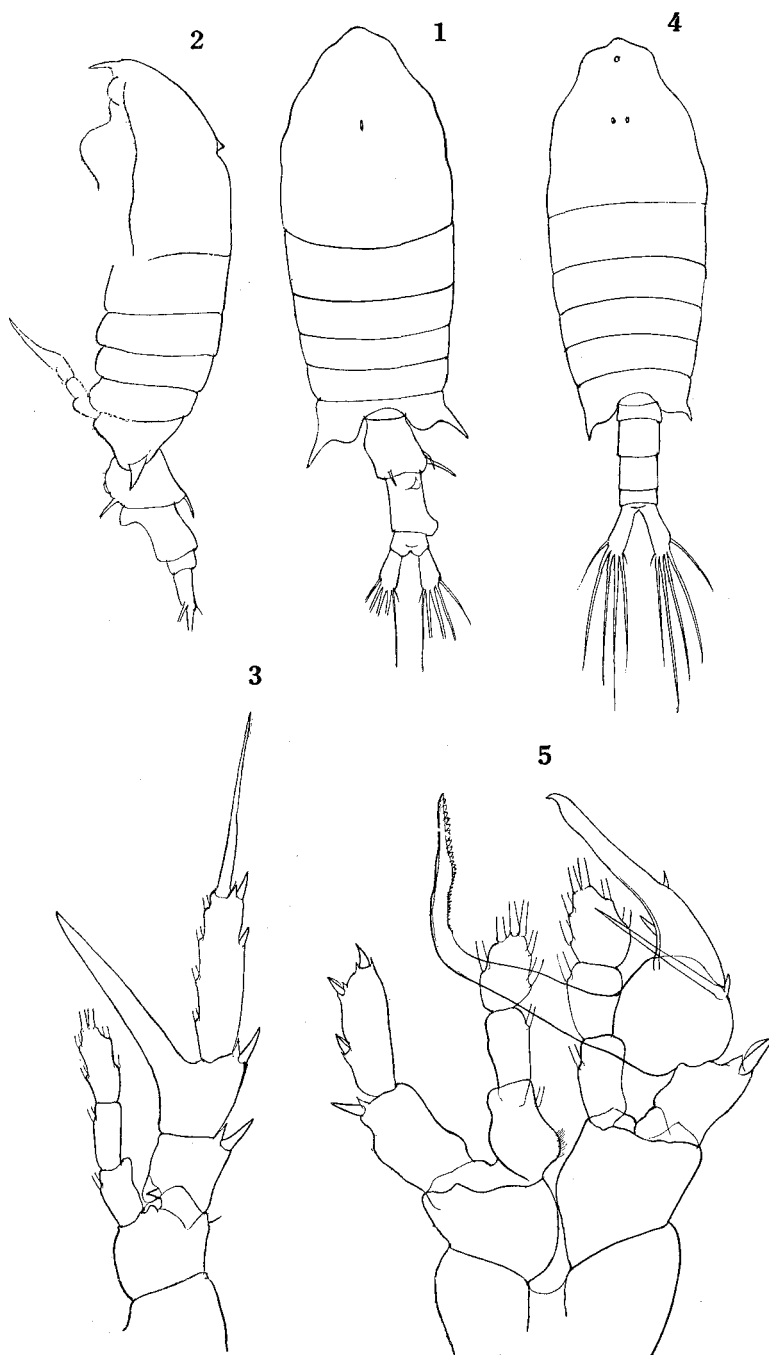


PLATE XXI

Pseudodiaptomus nudus sp. nov. (Figs. 1-9)

Female.

- Fig. 1. Dorsal view. $\times 47$
- Fig. 2. Head and 1st antenna, lateral view. $\times 93$
- Fig. 3. Last thoracic segment and abdomen, lateral view. $\times 93$
- Fig. 4. Genital segment, ventral view. $\times 133$
- Fig. 5. 1st foot. $\times 267$
- Fig. 6. 2nd foot. $\times 267$
- Fig. 7. 5th foot. $\times 133$

Male.

- Fig. 8. Last thoracic segment and abdomen, lateral view. $\times 93$
- Fig. 9. 5th feet, $\times 267$.

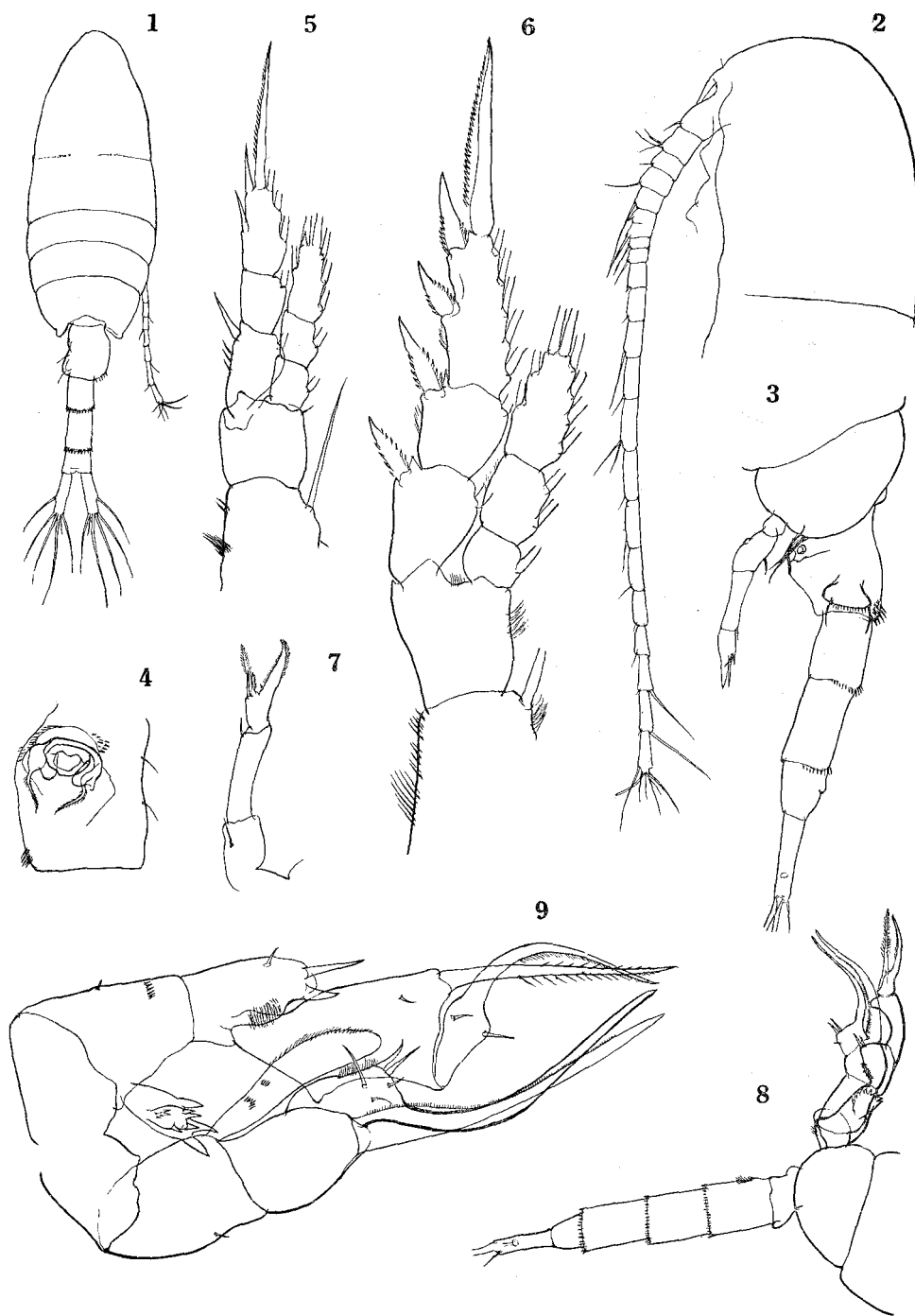


PLATE XXII

Metridia gerlachei GIESBRECHT (Figs. 1-8)

Female.

Fig. 1. Lateral view. $\times 19$

Fig. 2. Last thoracic segment and genital segment, lateral view.
 $\times 47$

Fig. 3. 2nd foot. $\times 93$

Fig. 4. 5th foot. $\times 133$

Male.

Fig. 5. Lateral view. $\times 33$

Fig. 6. 5th feet. $\times 133$

Immature female.

Fig. 7. 5th feet. $\times 133$

Immature male.

Fig. 8. 5th feet. $\times 133$

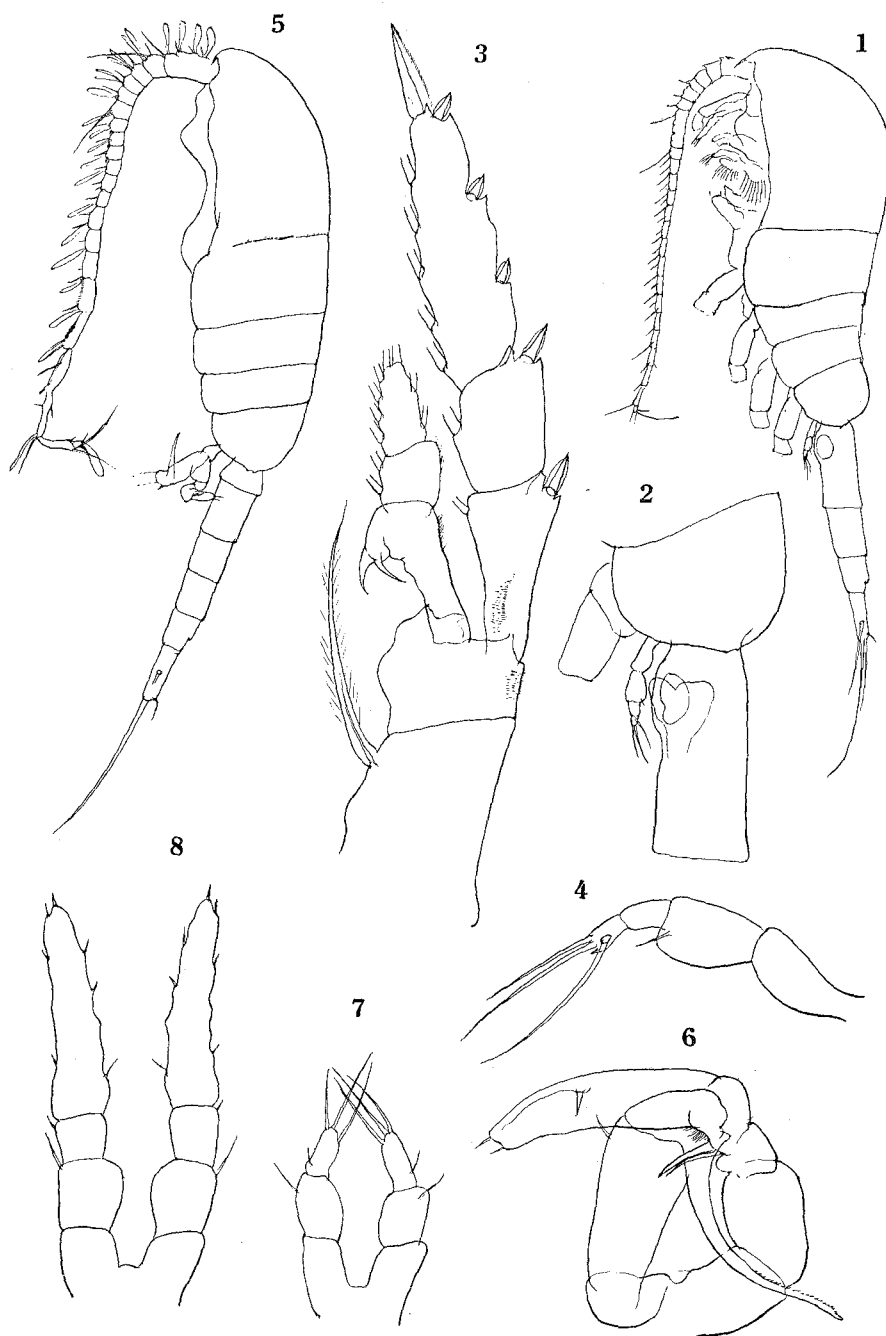


PLATE XXIII

Heterorhabdus farrani BRADY (Figs. 1-6)

Male.

- Fig. 1. Dorsal view. $\times 19$
- Fig. 2. Head, lateral view. $\times 27$
- Fig. 3. Thoracic segments and abdomen, lateral view. $\times 27$
- Fig. 4. 2nd maxilla. $\times 67$
- Fig. 5. Maxillipede. $\times 67$
- Fig. 6. 5th feet. $\times 67$

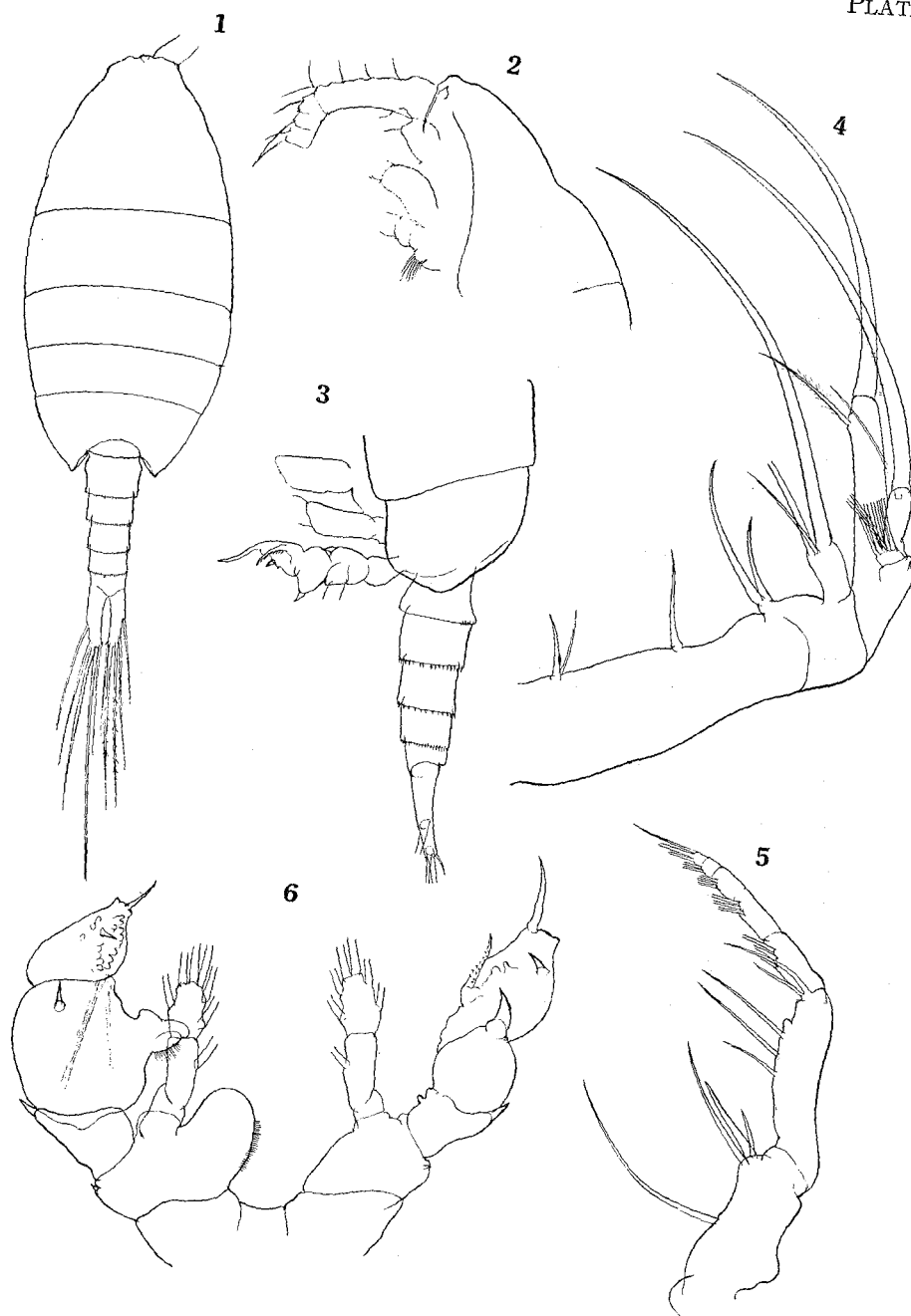


PLATE XXIV

Haloptilus ocellatus WOLFENDEN (Figs. 1-5)

Female.

- Fig. 1. Head, dorsal view. $\times 13$
- Fig. 2. Abdomen, dorsal view. $\times 13$
- Fig. 3. Mandible. $\times 33$
- Fig. 4. 1st maxilla. $\times 33$
- Fig. 5. 5th foot. $\times 33$

Acartia negligens DANA (Fig. 6)

Female.

- Fig. 6. Last thoracic segment and genital segment. $\times 133$

Oithona attenuata FARRAN (Figs. 7-12)

Female.

- Fig. 7. Head, dorsal view. $\times 67$
- Fig. 8. Abdomen, dorsal view. $\times 133$
- Fig. 9. 1st foot. $\times 267$
- Fig. 10. Endopod of 2nd foot. $\times 267$
- Fig. 11. 3rd foot. $\times 267$
- Fig. 12. Exopod of 4th foot. $\times 267$

PLATE XXIV

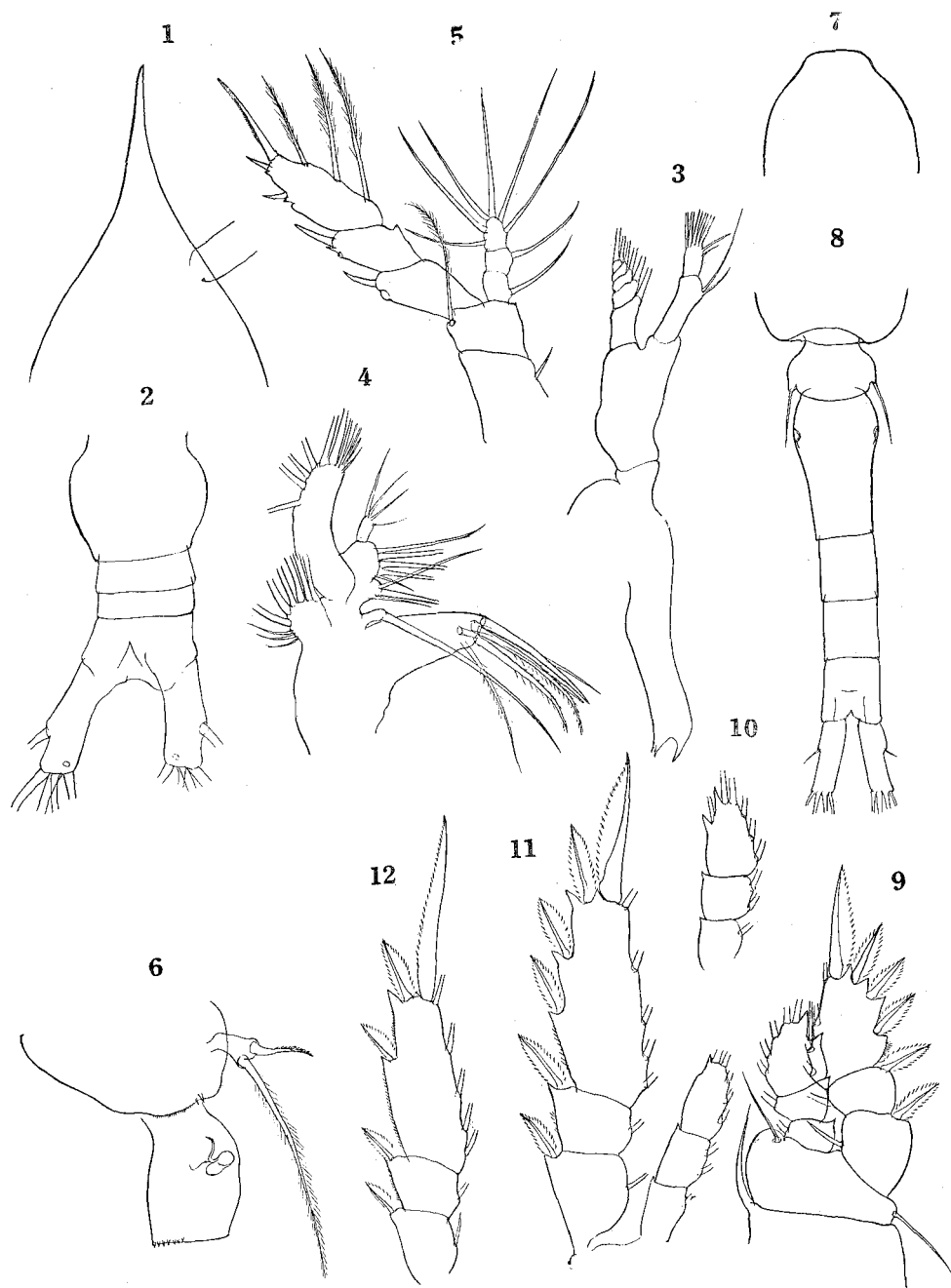


PLATE XXV

Oithona fallax FARRAN (Figs. 1-7)

Male.

- Fig. 1. Head, dorsal view. ×133
- Fig. 2. Head, lateral view. ×133
- Fig. 3. Abdomen, lateral view. ×133
- Fig. 4. Abdomen, dorsal view. ×133
- Fig. 5. Exopod of 1st foot. ×133
- Fig. 6. Exopod of 3rd foot. ×267
- Fig. 7. 4th foot. ×267.

Oithona frigida GIESBRECHT (Figs. 8-10)

Female.

- Fig. 8. Dorsal view. ×67
- Fig. 9. 1st foot. ×133
- Fig. 10. 4th foot. ×133

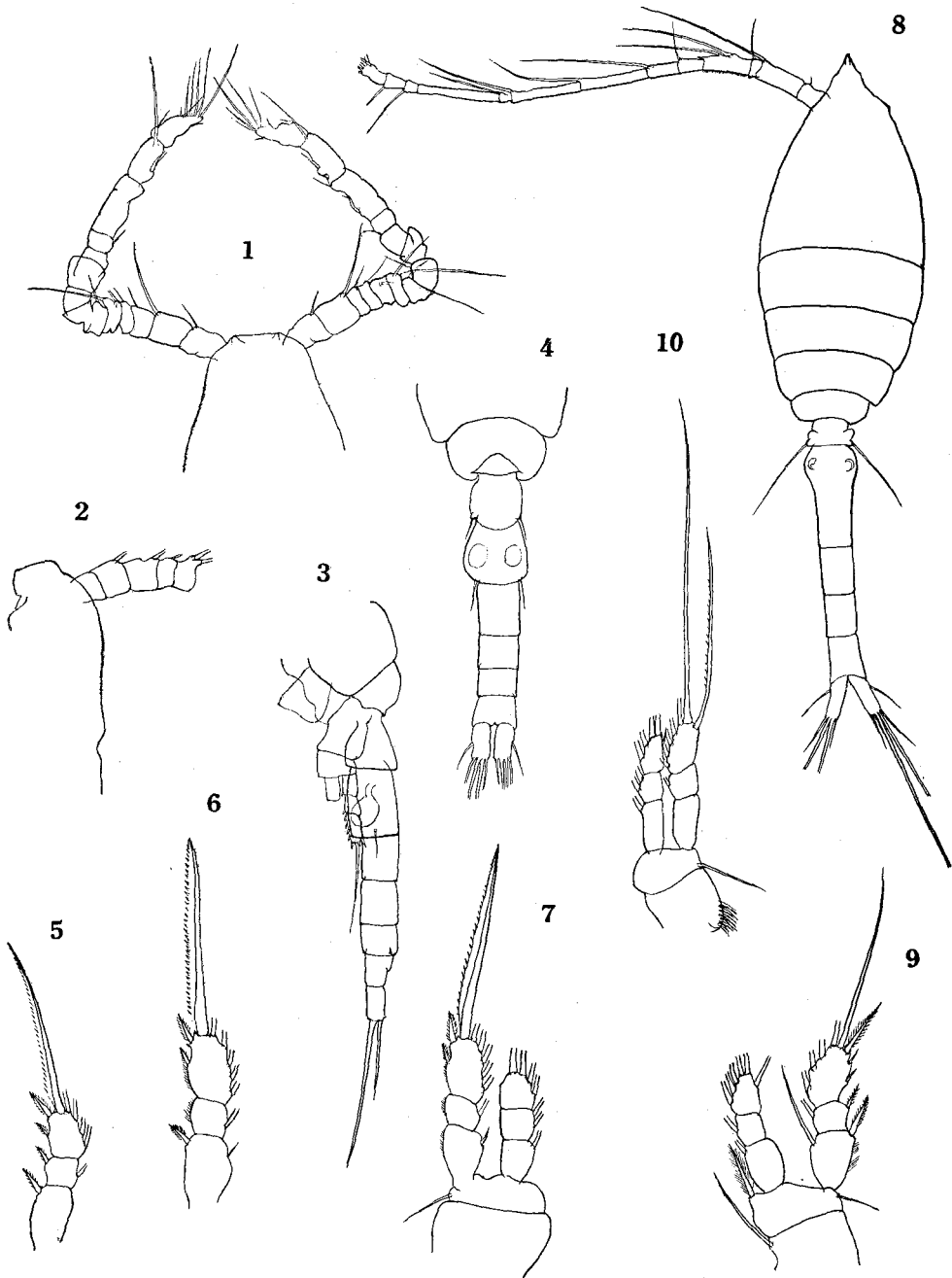


PLATE XXVI

Oithona nana GIESBRECHT (Figs. 1-4)

Female.

- Fig. 1. Cephalothorax, dorsal view. $\times 133$
Fig. 2. Head, lateral view. $\times 133$
Fig. 3. Abdomen, dorsal view. $\times 133$

Male.

- Fig. 4. Dorsal view. $\times 133$

Oithona oculata FARRAN (Figs. 5-10)

Female.

- Fig. 5. Head, lateral view. $\times 133$
Fig. 6. Head, dorsal view. $\times 67$
Fig. 7. Abdomen, dorsal view. $\times 133$
Fig. 8. Mandible. $\times 267$
Fig. 9. 1st foot. $\times 267$
Fig. 10. 4th foot. $\times 297$

Oithona plumifera BAIRD (Figs. 11-13)

Female.

- Fig. 11. Head, dorsal view. $\times 133$
Fig. 12. 5th thoracic segment and genital segment, dorsal view.
 $\times 133$
Fig. 13. 5th thoracic segment, and genital segment, lateral view.
 $\times 133$

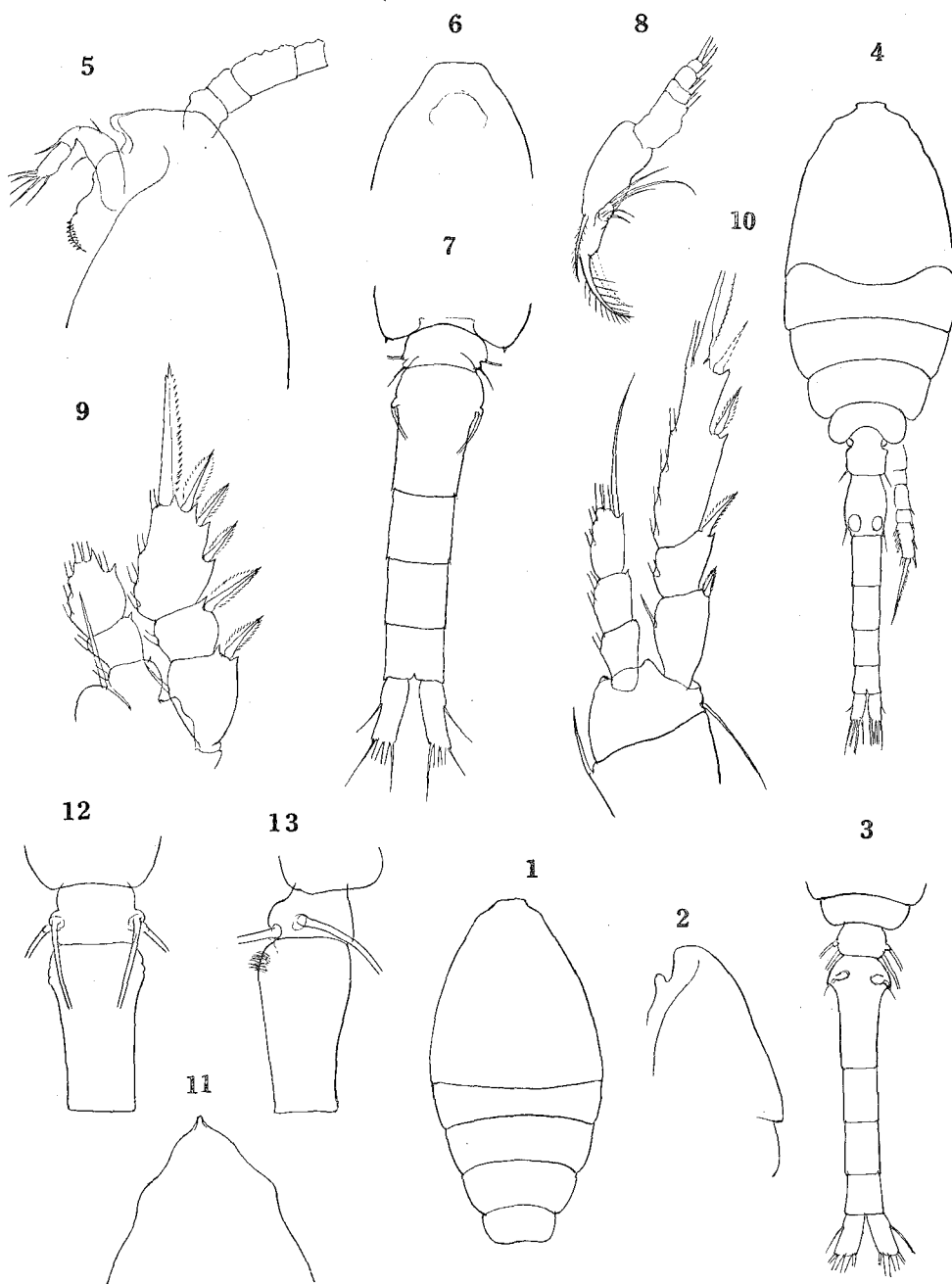


PLATE XXVII

Oithona similis CLAUS (Figs. 1-9)

Female.

- Fig. 1. Dorsal view. $\times 93$
- Fig. 2. 1st foot. $\times 267$
- Fig. 3. Exopod of 2nd foot. $\times 267$
- Fig. 4. 3rd foot. $\times 267$
- Fig. 5. 4th foot. $\times 267$
- Fig. 6. Dorsal view, other specimen, 0.75 mm. $\times 93$
- Fig. 7. Head, lateral view. $\times 133$
- Fig. 8. 1st foot. $\times 267$

Male.

- Fig. 9. Lateral view. $\times 133$

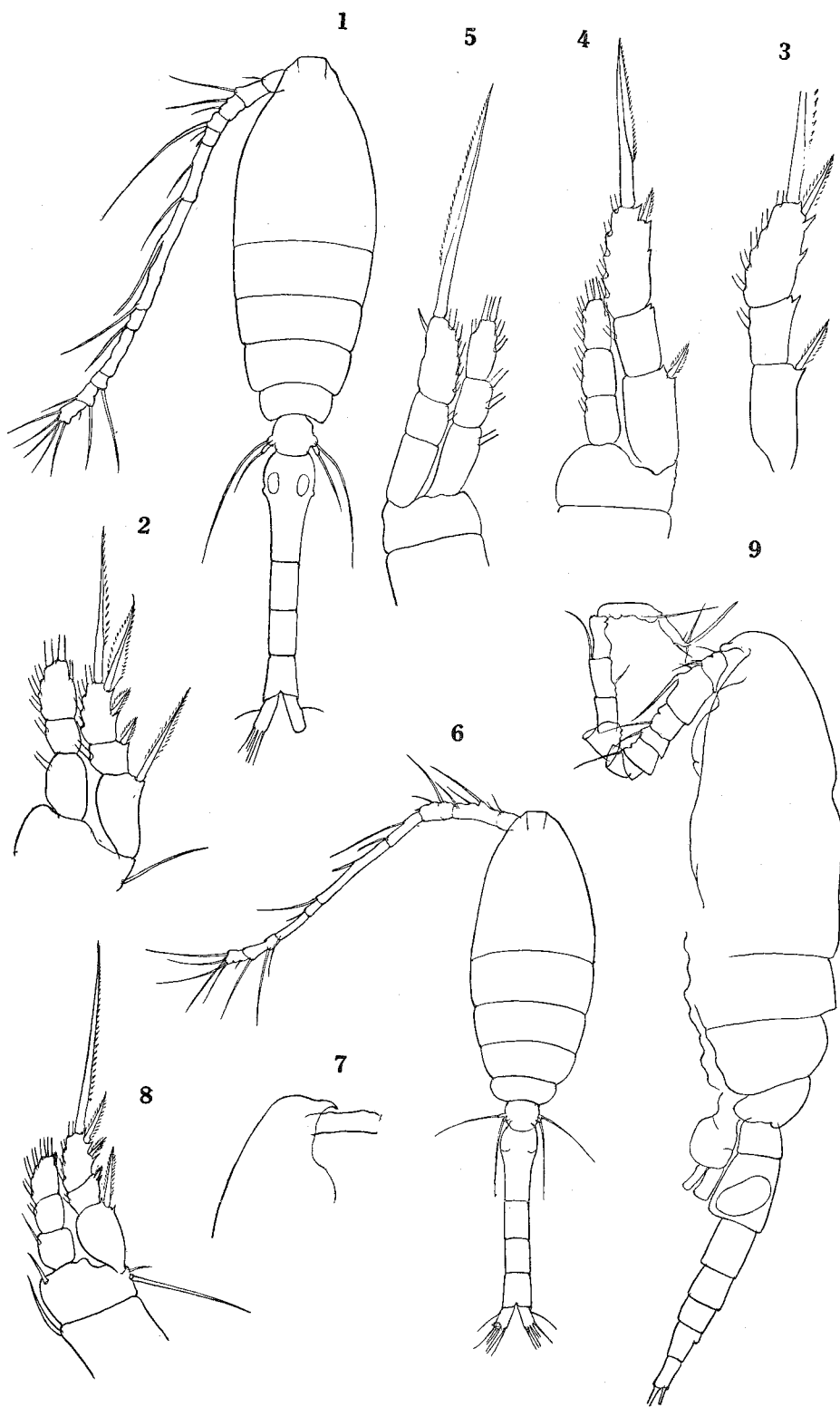


PLATE XXVIII

Oithona simplex FARRAN (Figs. 1-6)

Female.

- Fig. 1. Dorsal view. $\times 133$
- Fig. 2. 1st foot. $\times 267$
- Fig. 3. 2nd foot. $\times 267$
- Fig. 4. 3rd foot. $\times 267$
- Fig. 5. 4th foot. $\times 267$

Male.

- Fig. 6. Dorsal view. $\times 133$

Oncaea clevei FRÜCHTL (Figs. 7-13)

Female.

- Fig. 7. Dorsal view. $\times 93$
- Fig. 8. Abdomen, lateral view. $\times 93$
- Fig. 9. Head, lateral view. $\times 133$
- Fig. 10. Endopod of 3rd foot. $\times 267$
- Fig. 11. 5th foot. $\times 267$

Male.

- Fig. 12. Abdomen, dorsal view. $\times 267$
- Fig. 13. Abdomen, lateral view. $\times 133$

PLATE XXVIII

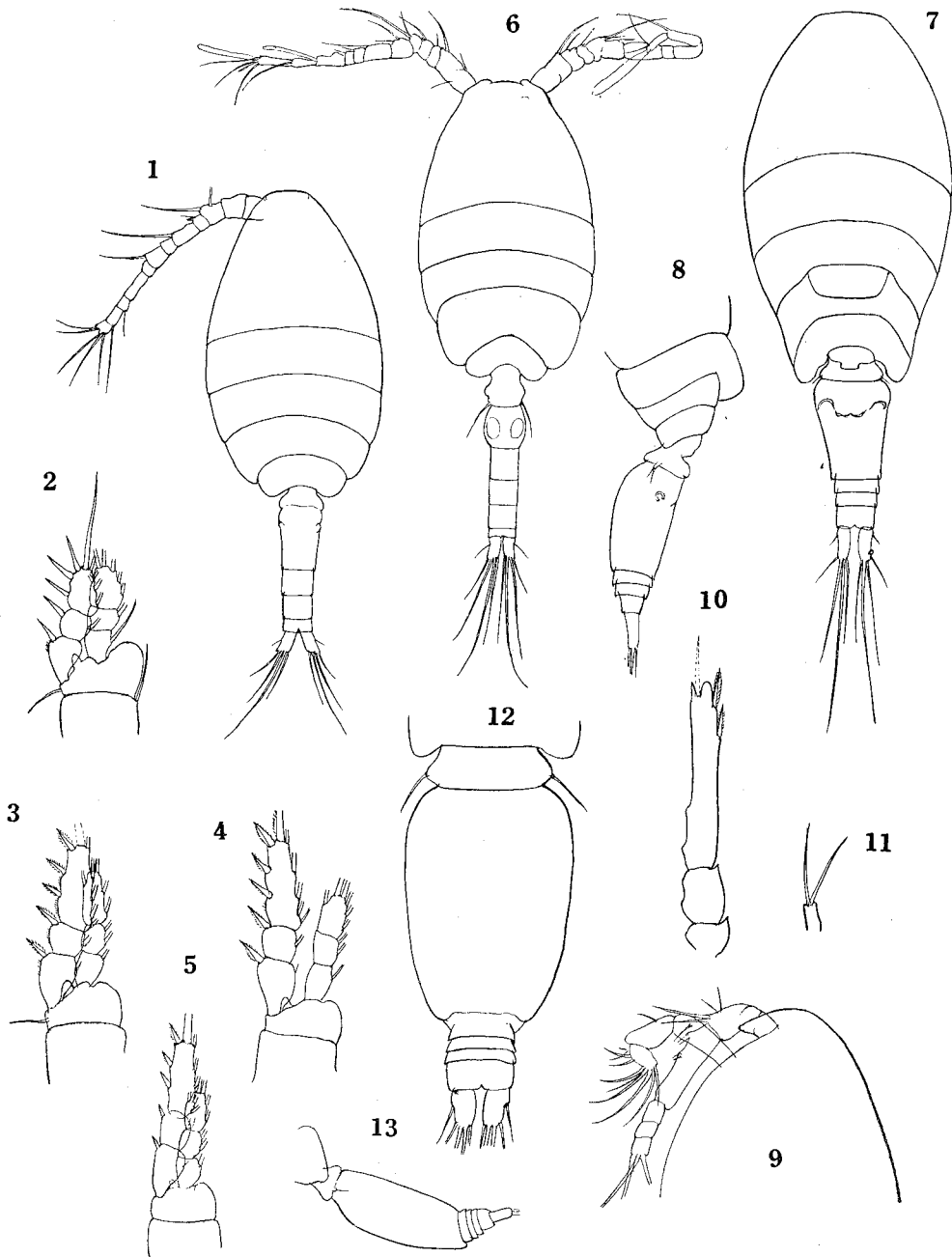


PLATE XXIX

Oncaea conifera GIESBRECHT (Figs. 1-8)

Female.

Fig. 1. Dorsal view. $\times 67$

Fig. 2. Lateral view. $\times 67$

Male.

Fig. 3. Dorsal view. $\times 133$

Fig. 4. Head, lateral view. $\times 133$

Fig. 5. Abdomen, lateral view. $\times 133$

Fig. 6. 2nd foot. $\times 267$

Fig. 7. 3rd foot. $\times 267$

Fig. 8. Endopod of 4th foot. $\times 267$

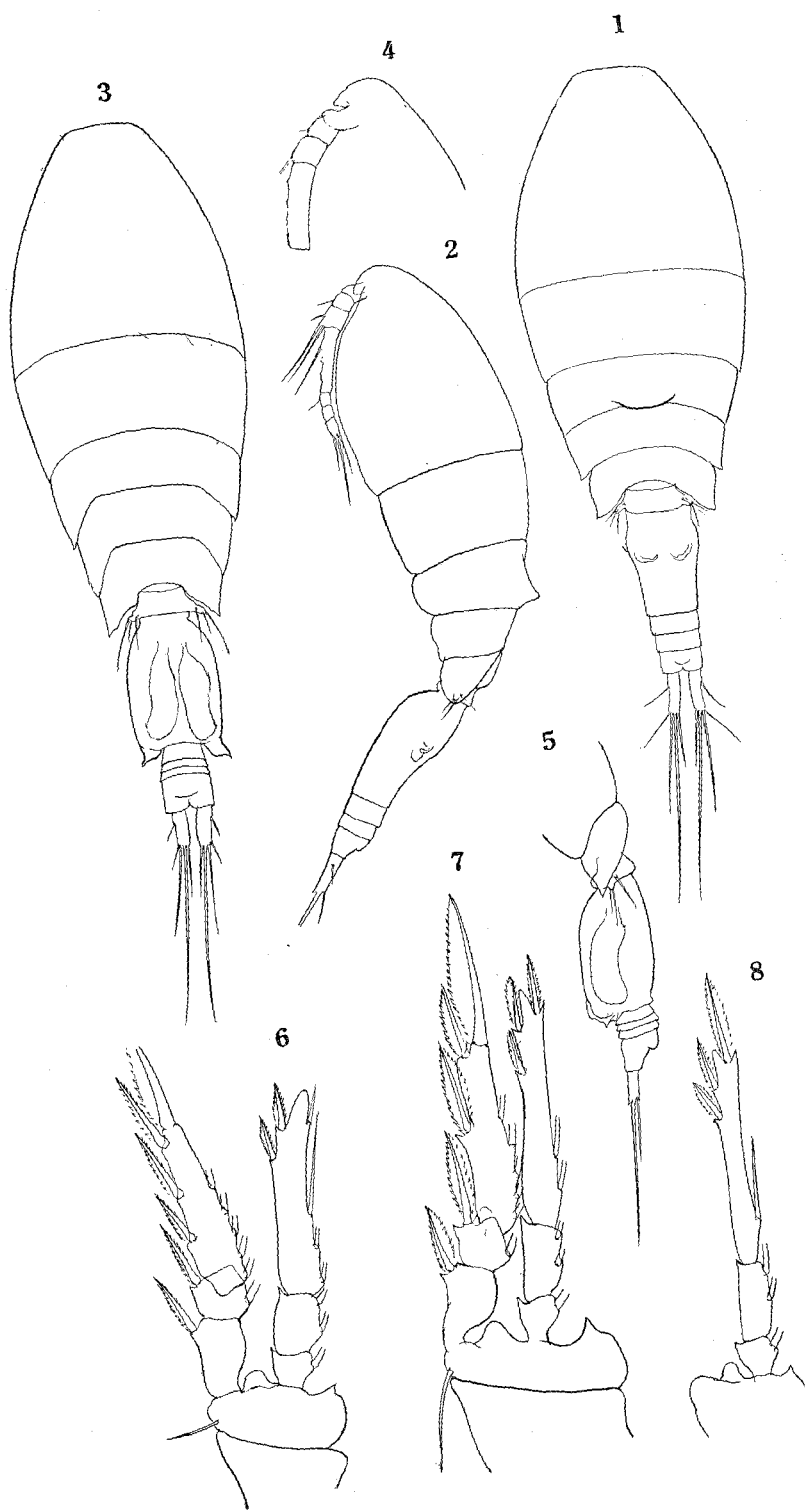


PLATE XXX

Oncaea curvata GIESBRECHT (Figs. 1-11)

Female.

- Fig. 1. Dorsal view. $\times 100$
- Fig. 2. Head, lateral view. $\times 133$
- Fig. 3. Abdomen, lateral view. $\times 133$
- Fig. 4. 2nd antenna. $\times 267$
- Fig. 5. 2nd maxilla. $\times 267$
- Fig. 6. Maxillipede. $\times 267$
- Fig. 7. 1st foot. $\times 267$
- Fig. 8. 2nd foot. $\times 267$
- Fig. 9. 3rd foot. $\times 267$
- Fig. 10. 4th foot. $\times 267$
- Fig. 11. 5th foot. $\times 267$

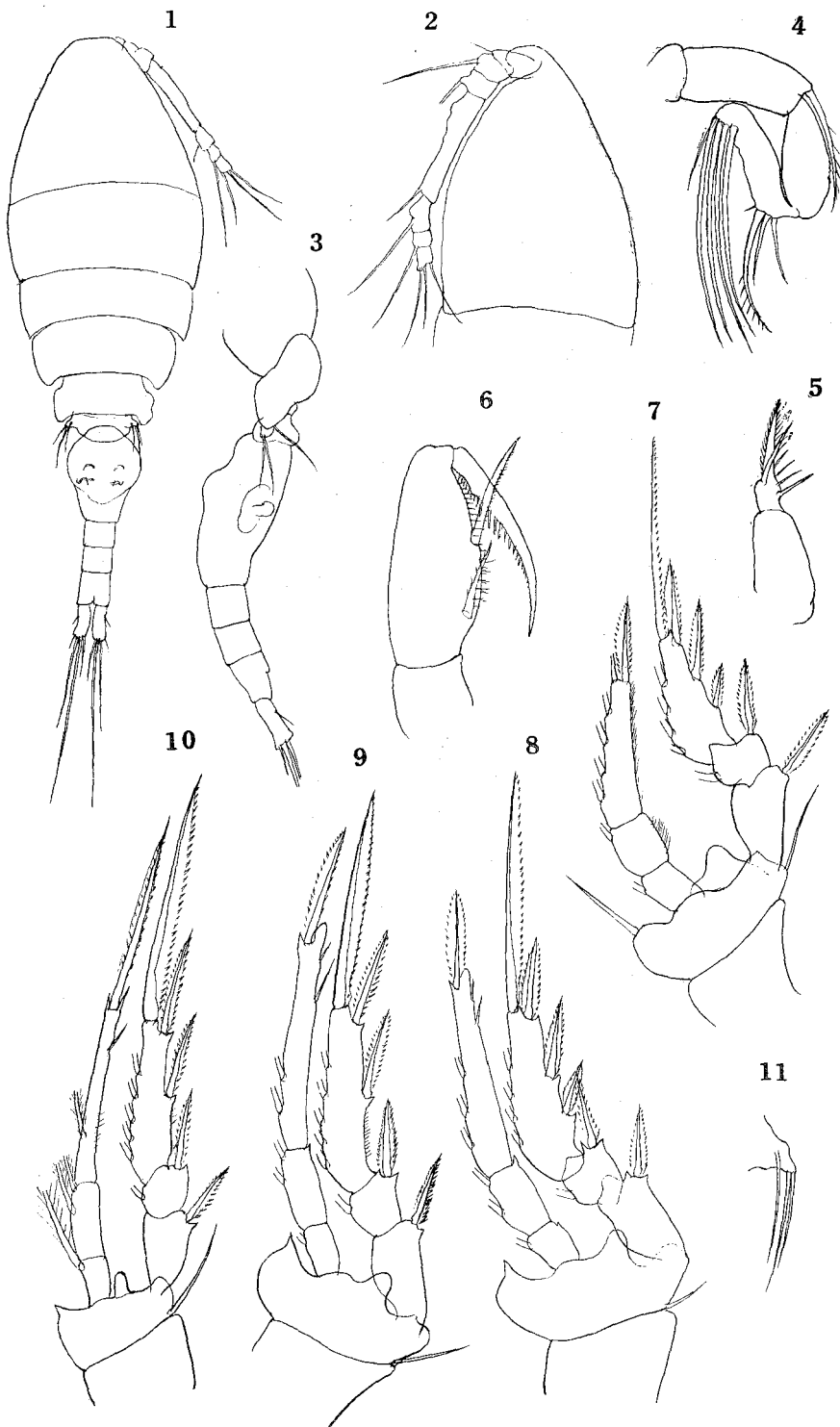


PLATE XXXI

Oncaea curvata GIESBRECHT (Figs. 1-3)

Male.

Fig. 1. Dorsal view. $\times 133$

Fig. 2. Abdomen, lateral view. $\times 267$

Fig. 3. Head, lateral view. $\times 267$

Oncaea media GIESBRECHT (Figs. 4-9)

Female.

Fig. 4. Dorsal view, forma *minor*. $\times 93$

Fig. 5. 4th foot. $\times 267$

Fig. 6. 4th foot, forma *major*. $\times 267$

Male.

Fig. 7. Abdomen, dorsal view, $\times (0.74\text{mm})$. $\times 133$

Fig. 8. Abdomen, dorsal view, (0.56mm) . $\times 133$

Fig. 9. Abdomen, lateral view, (0.93mm) . $\times 133$

PLATE XXXI

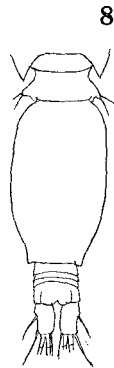
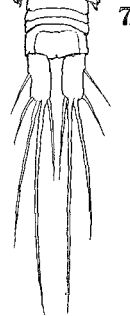
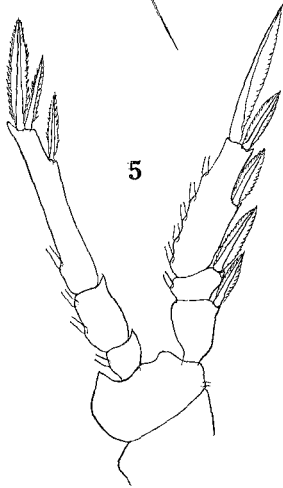
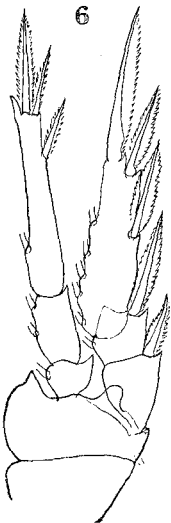
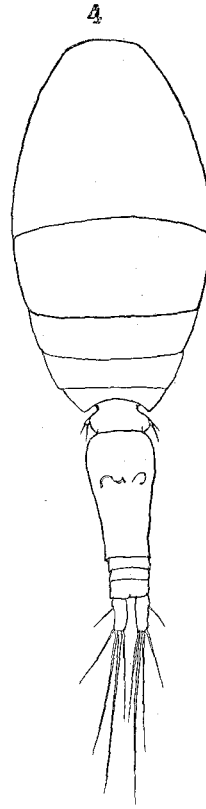
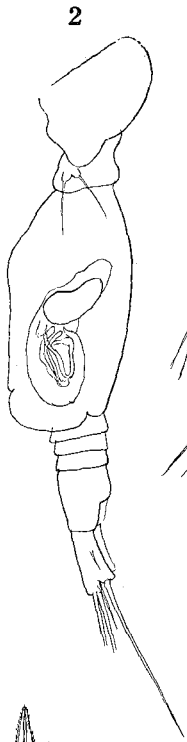
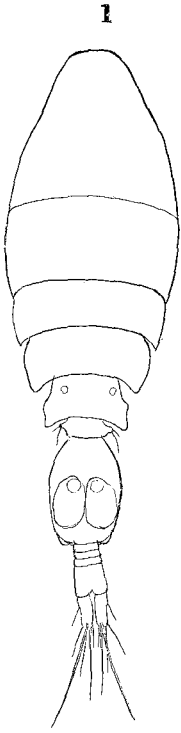


PLATE XXXII

Oncaea notopus GIESBRECHT (Figs. 1-7)

Female.

Fig. 1. Dorsal view. $\times 133$

Fig. 2. Abdomen, lateral view. $\times 133$

Fig. 3. 1st antenna. $\times 267$

Male.

Fig. 4. Dorsal view. $\times 133$

Fig. 5. Head, lateral view. $\times 133$

Fig. 6. Abdomen, lateral view. $\times 133$

Immature female.

Fig. 7. Abdomen, lateral view. $\times 133$

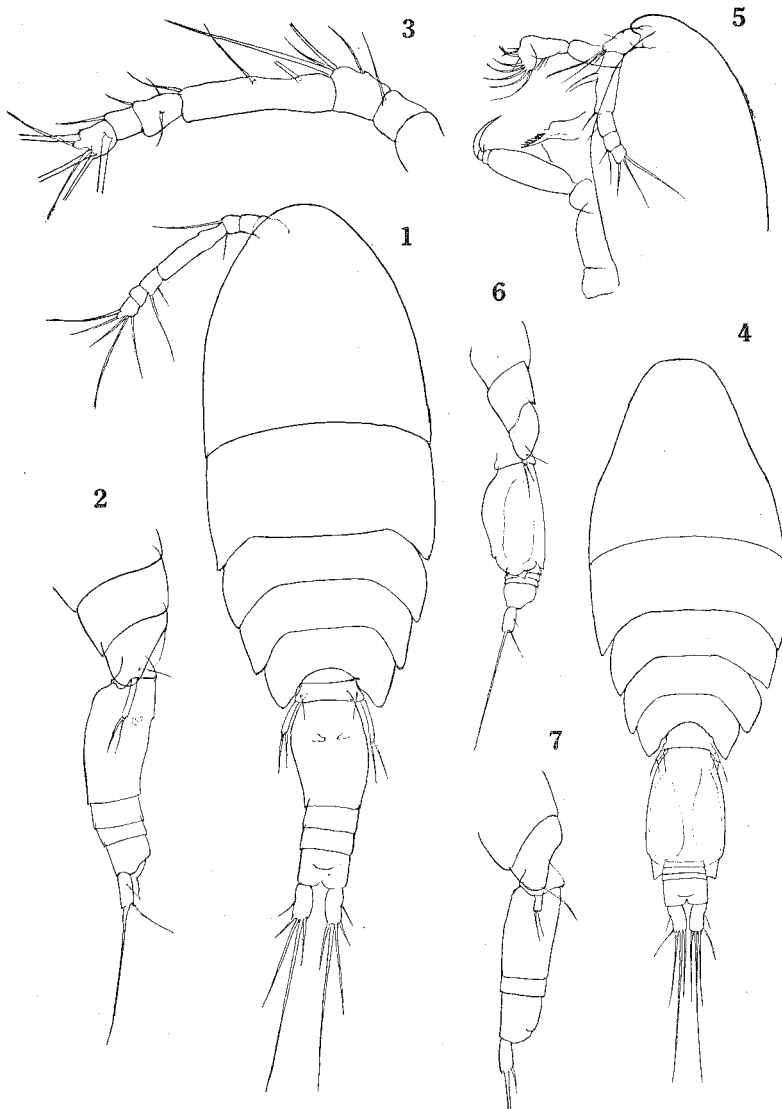


PLATE XXXIII

Pseudanthessius minimus sp. nov. (Figs. 1-18)

Female.

- Fig. 1. Dorsal view. $\times 93$
- Fig. 2. Head, lateral view. $\times 133$
- Fig. 3. Abdomen, lateral view. $\times 133$
- Fig. 4. Rostrum. $\times 267$
- Fig. 5. 1st antenna. $\times 267$
- Fig. 6. 2nd antenna. $\times 267$
- Fig. 7. Mandible. $\times 267$
- Fig. 8. 1st maxilla. $\times 267$
- Fig. 9. 2nd maxilla. $\times 267$
- Fig. 10. Maxillipede. $\times 267$
- Fig. 11. 1st foot. $\times 267$
- Fig. 12. Endopod of 2nd foot. $\times 267$
- Fig. 13. 4th foot. $\times 267$
- Fig. 14. Endopod of 4th foot. $\times 267$
- Fig. 15. 5th foot. $\times 267$

Male.

- Fig. 16. Dorsal view. $\times 67$
- Fig. 17. Abdomen, lateral view. $\times 133$
- Fig. 18. Maxillipede. $\times 267$

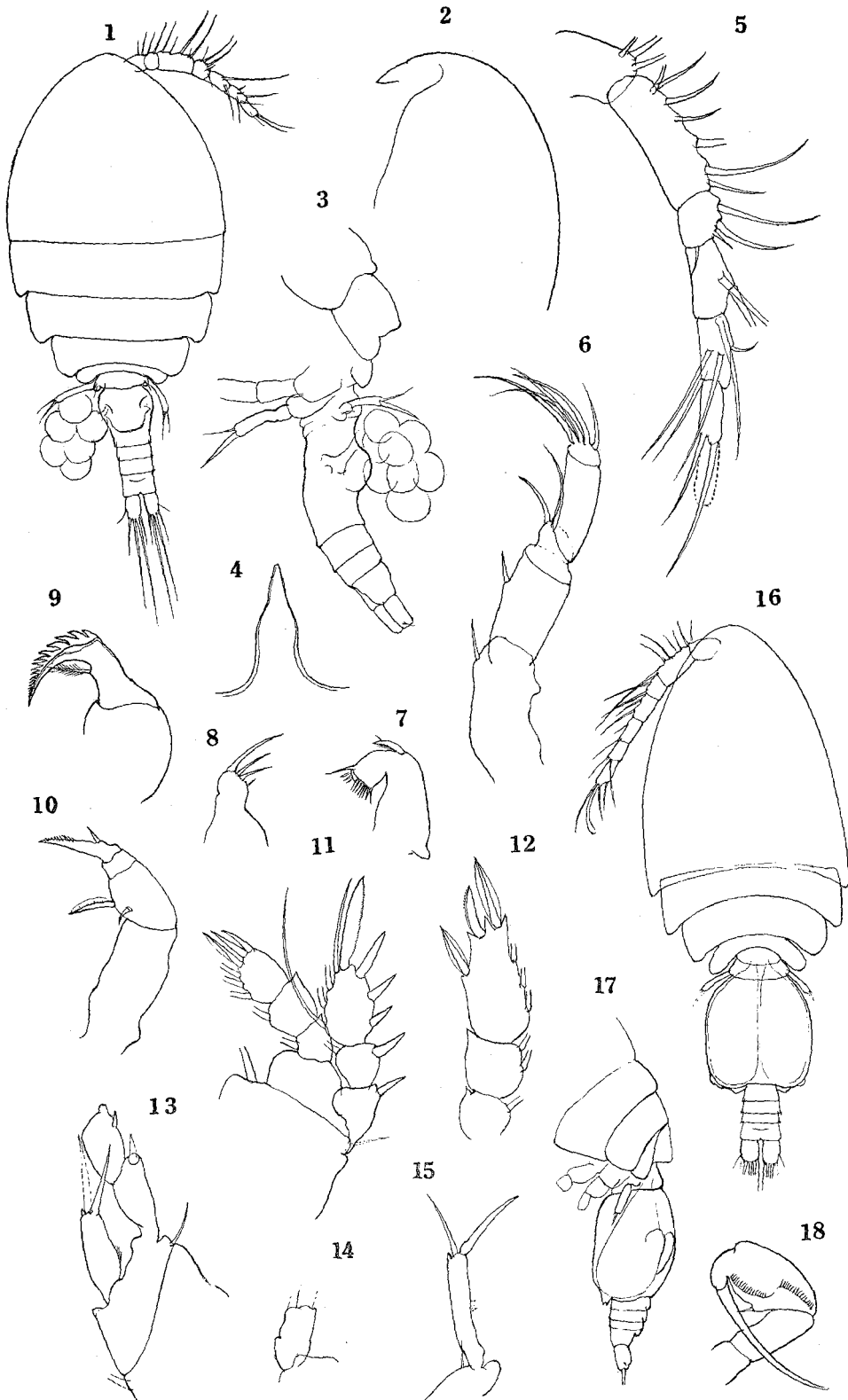


PLATE XXXIV

Corycaeus (Ditrichocorycaeus) andrewsi FARRAN (Figs. 1-2)

Male.

Fig. 1. Abdomen, dorsal view. $\times 93$

Fig. 2. Abdomen, lateral view. $\times 93$

Corycaeus (Ditrichocorycaeus) asiaticus F. DAHL (Figs. 3-4)

Male.

Fig. 3. Abdomen, dorsal view. $\times 93$

Fig. 4. Abdomen, lateral view. $\times 93$

Corycaeus (Ditrichocorycaeus) dahli TANAKA (Figs. 5-7)

Female.

Fig. 5. Abdomen, dorsal view. $\times 133$

Fig. 6. Abdomen, lateral view. $\times 133$

Fig. 7. Abnormal furcal rami. $\times 133$

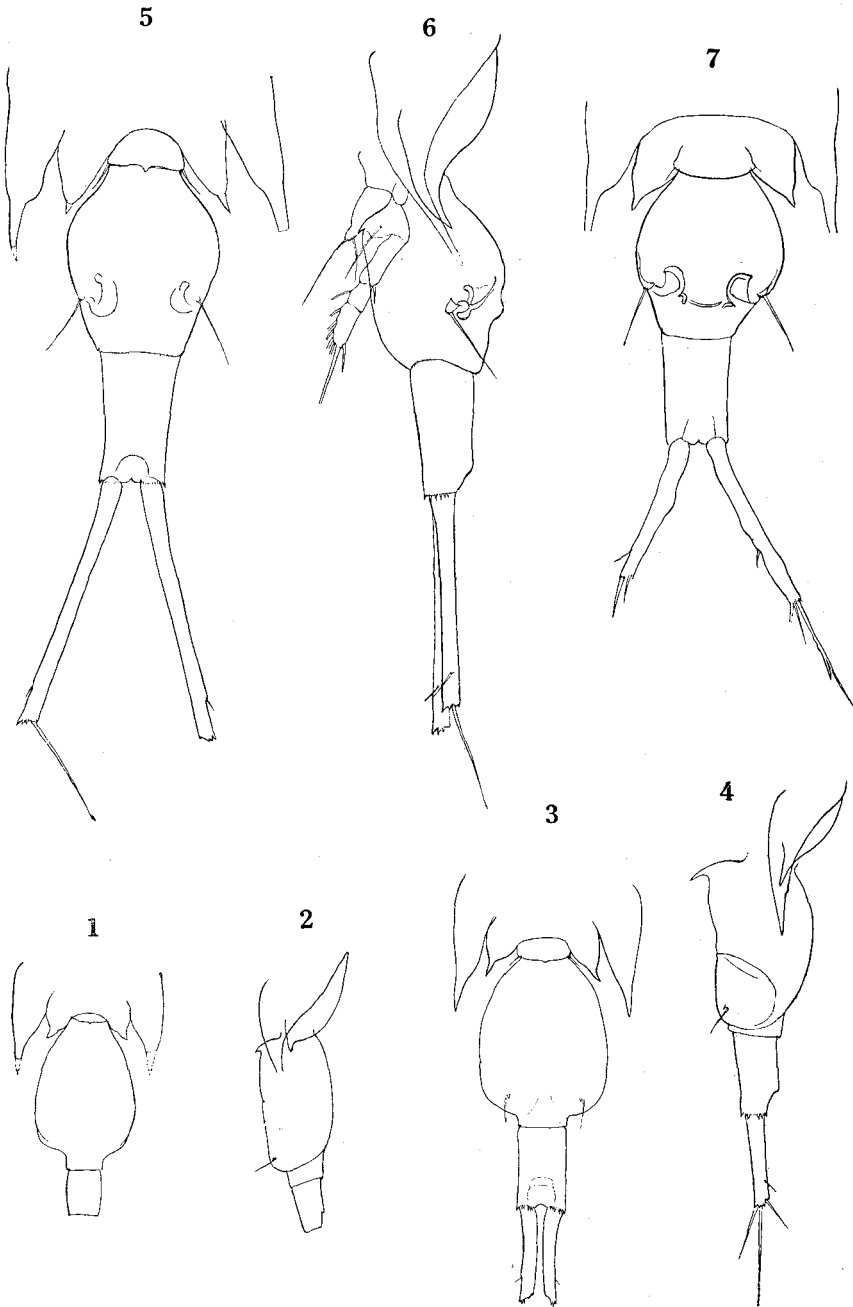


PLATE XXXV

Corycaeus (Ditrichocorycaeus) erythraeus CLEVE (Figs. 1-8)

Female.

- Fig. 1. Last thoracic segment and abdomen, dorsal view. $\times 133$
- Fig. 2. Last thoracic segment and abdomen, lateral view. $\times 133$
- Fig. 3. 2nd antenna. $\times 267$
- Fig. 4. Terminal spine of exopod of 1st foot. $\times 267$
- Fig. 5. 2nd foot, $\times 133$.
- Fig. 6. Terminal spine of exopod of 2nd foot. $\times 267$
- Fig. 7. Terminal spine of exopod of 3rd foot. $\times 267$
- Fig. 8. 5th foot. $\times 267$

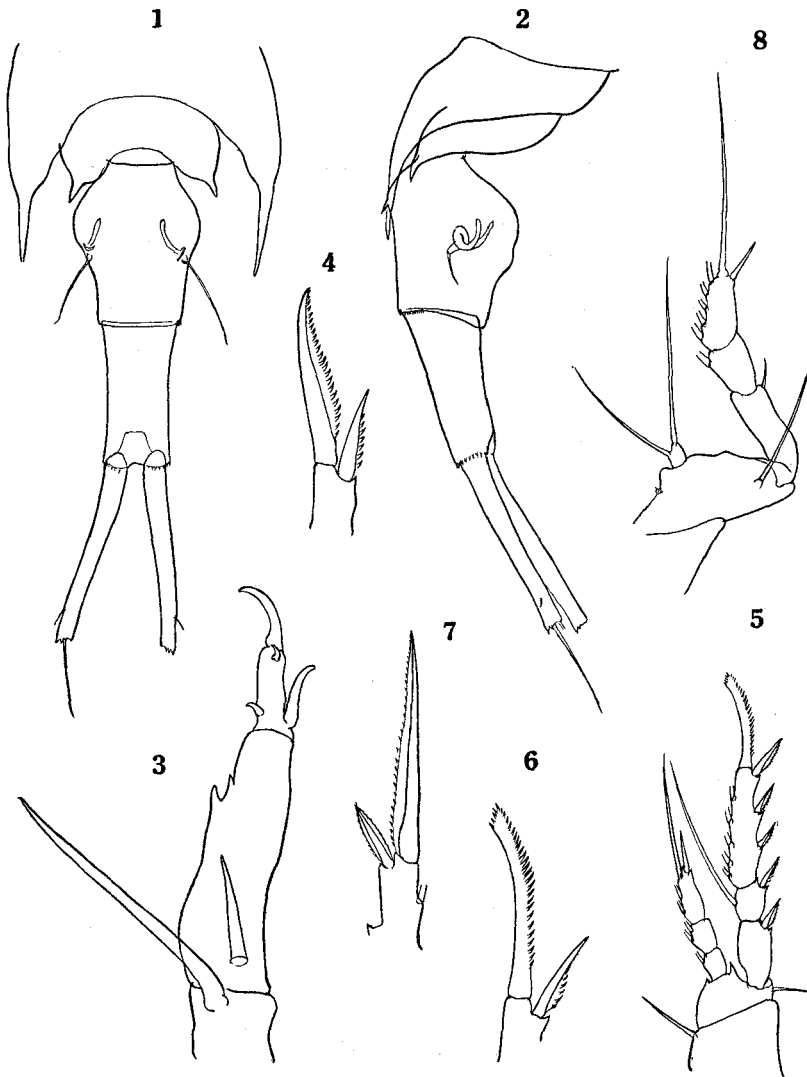


PLATE XXXVI

Corycaeus (Ditrichocorycaeus) subtilis M. DAHL (Figs. 1-3)

Female.

Fig. 1. Abdomen, lateral view. $\times 133$

Male.

Fig. 2. Dorsal view. $\times 93$

Fig. 3. Abdomen, lateral view. 133

Corycaeus (Onychocorycaeus) agilis DANA (Figs. 4-5)

Male.

Fig. 4. Abdomen, dorsal view, specimen with long abdomen. $\times 133$

Fig. 5. Abdomen, dorsal view, specimen with normal abdomen. $\times 133$

Corycaeus (Onychocorycaeus) giesbrechti F. DAHL (Figs. 6-10)

Female.

Fig. 6. Dorsal view. $\times 67$

Fig. 7. Abdomen, lateral view. $\times 133$

Fig. 8. 2nd antenna. $\times 267$

Male.

Fig. 9. Abdomen, dorsal view. $\times 133$

Fig. 10. Abdomen, lateral view. $\times 133$

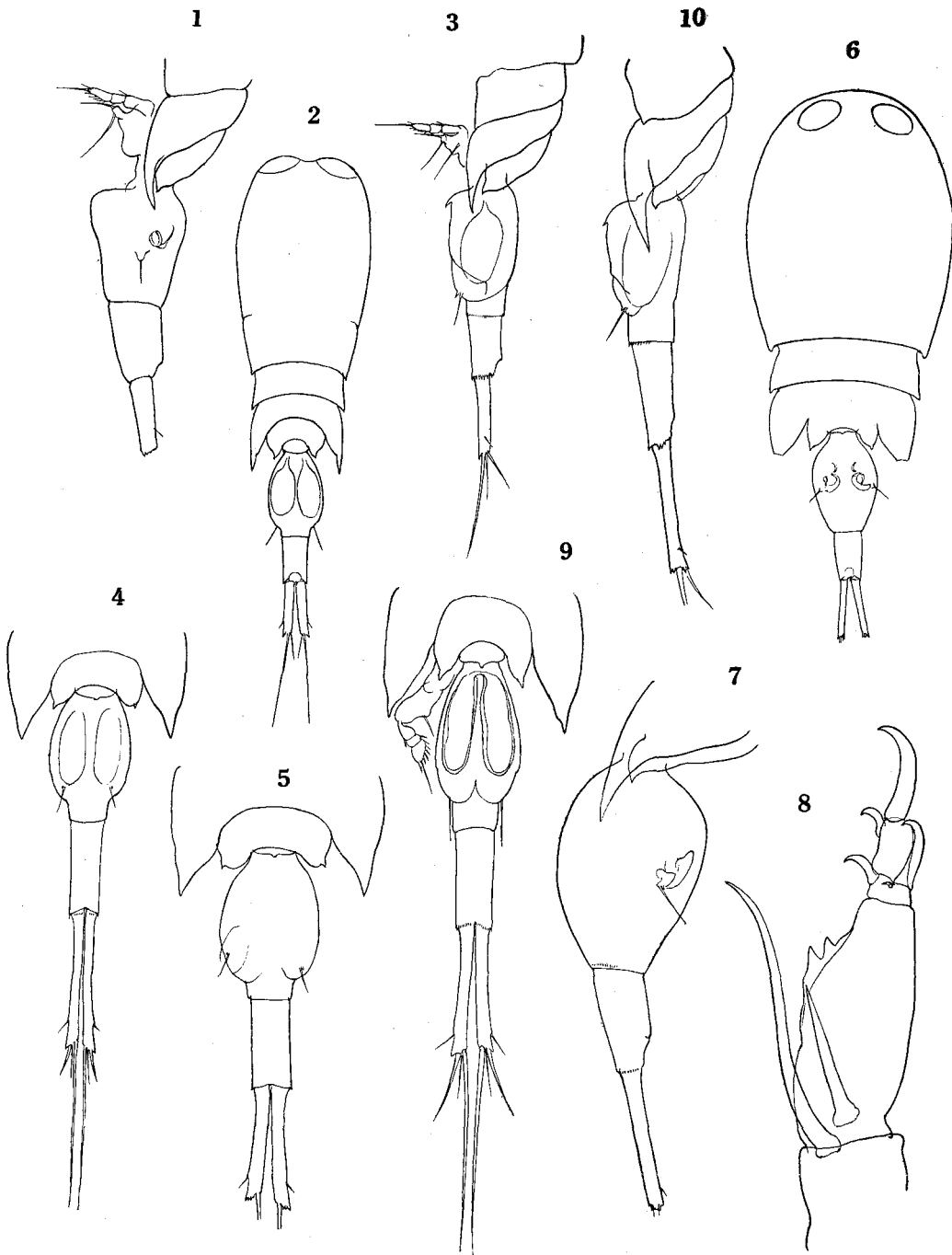


PLATE XXXVII

Corycaeus (Onychocorycaeus) pacificus F. DAHL (Figs. 1-3)

Female.

- Fig. 1. Dorsal view. $\times 67$
- Fig. 2. Abdomen, dorsal view. $\times 93$
- Fig. 3. Abdomen, lateral view. $\times 93$

Corycaeus (Onychocorycaeus) pumilus M. Dahl (Figs. 4-8)

Male.

- Fig. 4. Cephalothorax, dorsal view. $\times 133$
- Fig. 5. Abdomen, dorsal view. $\times 133$
- Fig. 6. Abdomen, lateral view. $\times 133$
- Fig. 7. 2nd antenna. $\times 267$
- Fig. 8. Exopod of 2nd foot. $\times 267$

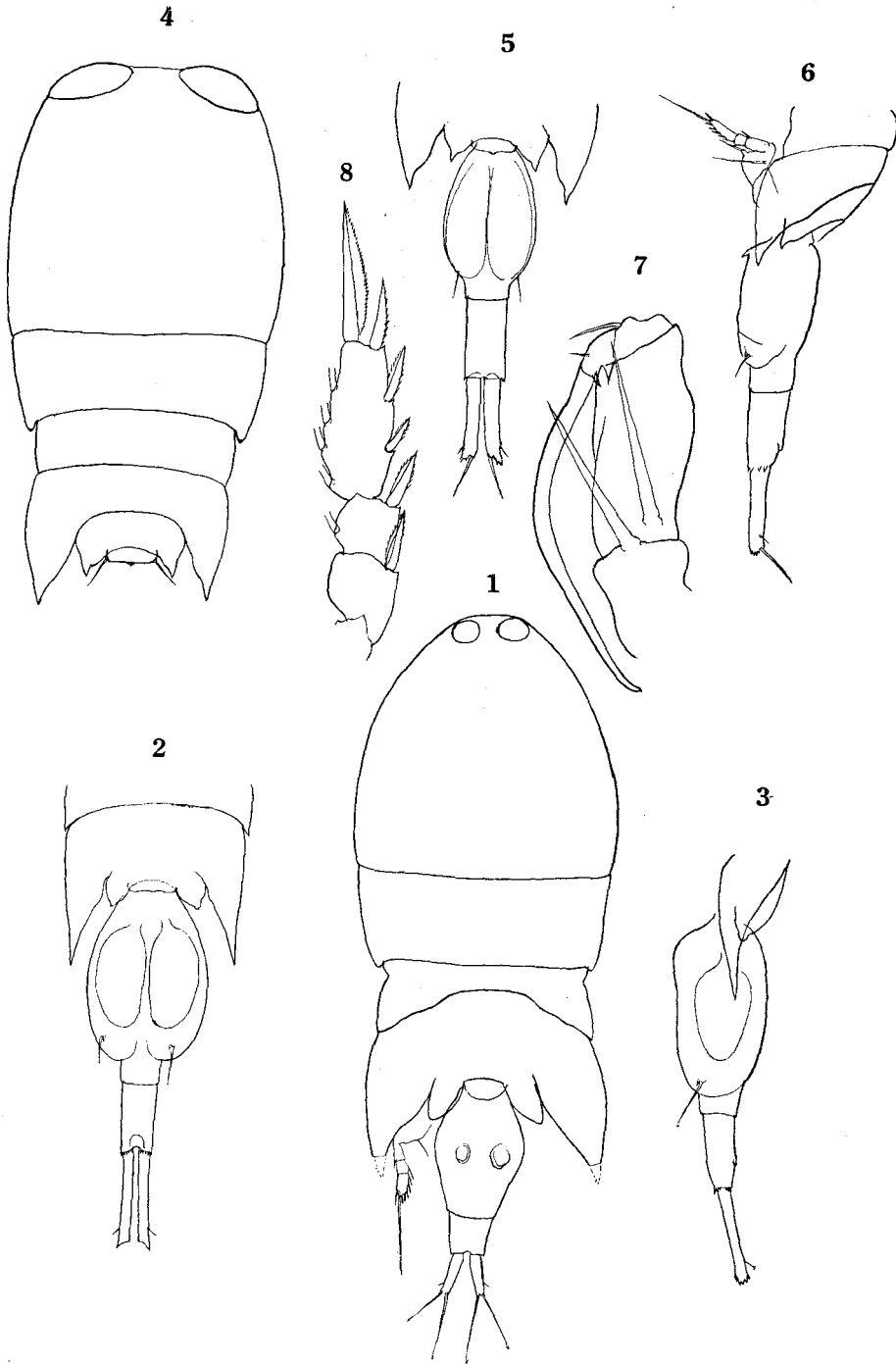


PLATE XXXVIII

Corycaeus (Corycella) carinatus GIESBRECHT (Figs. 1-3)

Female.

- Fig. 1. Dorsal view. $\times 67$
Fig. 2. Abdomen, lateral view. $\times 133$
Fig. 3. Abdomen, dorsal view. $\times 133$

Corycaeus (Corycella) concinnus DANA (Figs. 4-7)

Female.

- Fig. 4. Abdomen, dorsal view. $\times 133$
Fig. 5. Abdomen, lateral view. $\times 133$
Fig. 6. Abdomen, dorsal view. other specimen (0.81mm), $\times 133$

Male.

- Fig. 7. Abdomen, lateral view. $\times 133$

Corycaeus (Corycella) curtus FARRAN (Figs. 8-11)

Female.

- Fig. 8. Abdomen, dorsal view. $\times 133$
Fig. 9. Abdomen, lateral view. $\times 133$.
Fig. 10. 1st foot. $\times 267$
Fig. 11. 3rd and 4th feet. $\times 267$

Corycaeus (Corycella) gibbulus GIESBRECHT (Fig. 12)

Male.

- Fig. 12. Abdomen, lateral view. $\times 133$

PLATE XXXVIII

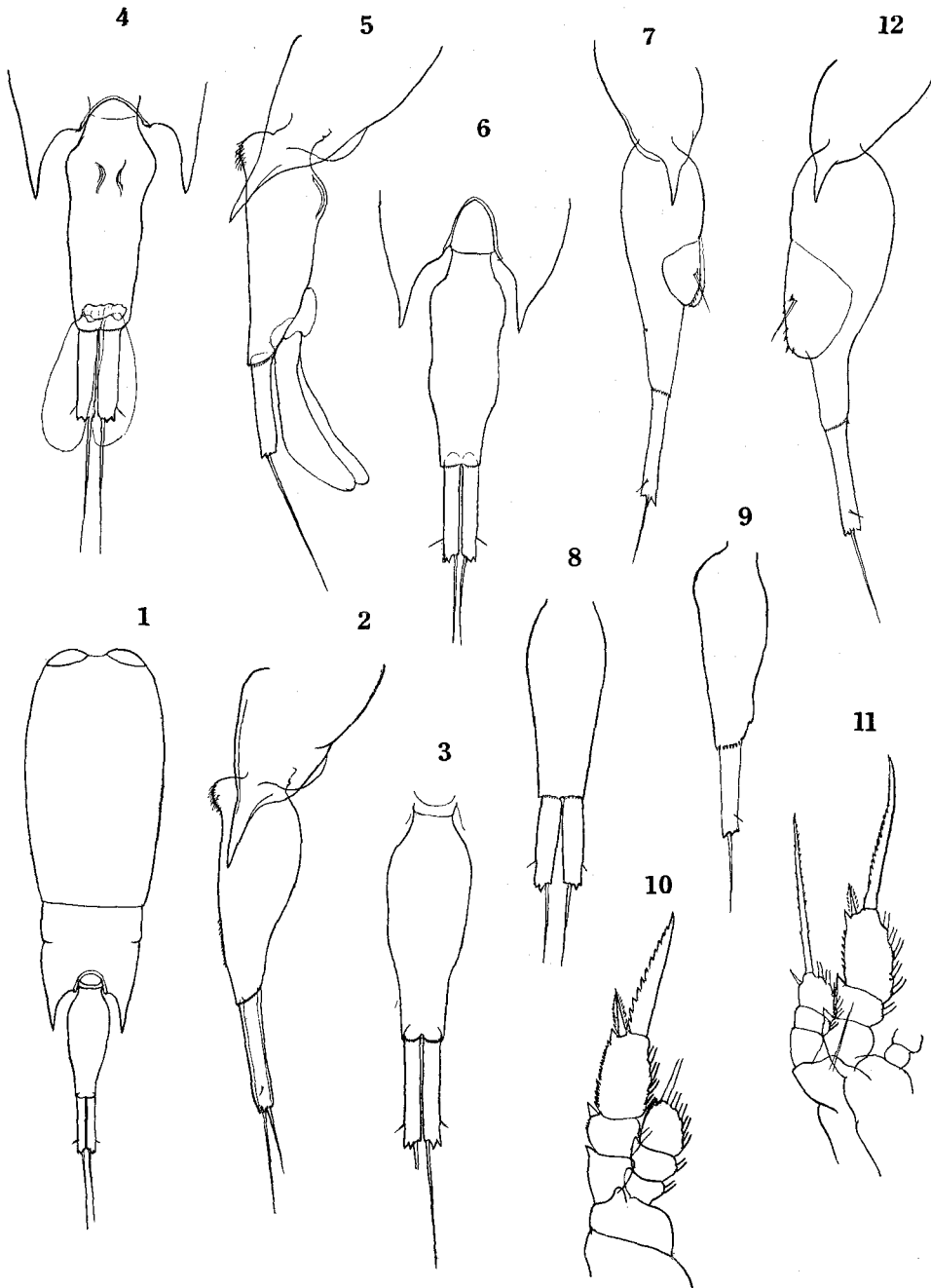


PLATE XXXIX

Corycaeus (Corycella) longicaudis DANA (Figs. 1-4)

Female.

Fig. 1. Dorsal view. $\times 67$

Fig. 2. Lateral view. $\times 67$

Fig. 3. Abdomen, dorsal view. $\times 133$

Fig. 4. 4th foot. $\times 167$

Corycaeus (Corycella) rostratus CLAUS (Figs. 5-9)

Female.

Fig. 5. Lateral view. $\times 67$

Fig. 6. Abdomen, dorsal view. $\times 133$

Fig. 7. Abdomen, lateral view. $\times 133$

Male.

Fig. 8. Abdomen, lateral view. $\times 133$

Fig. 9. 1st foot. $\times 267$

PLATE XXXIX

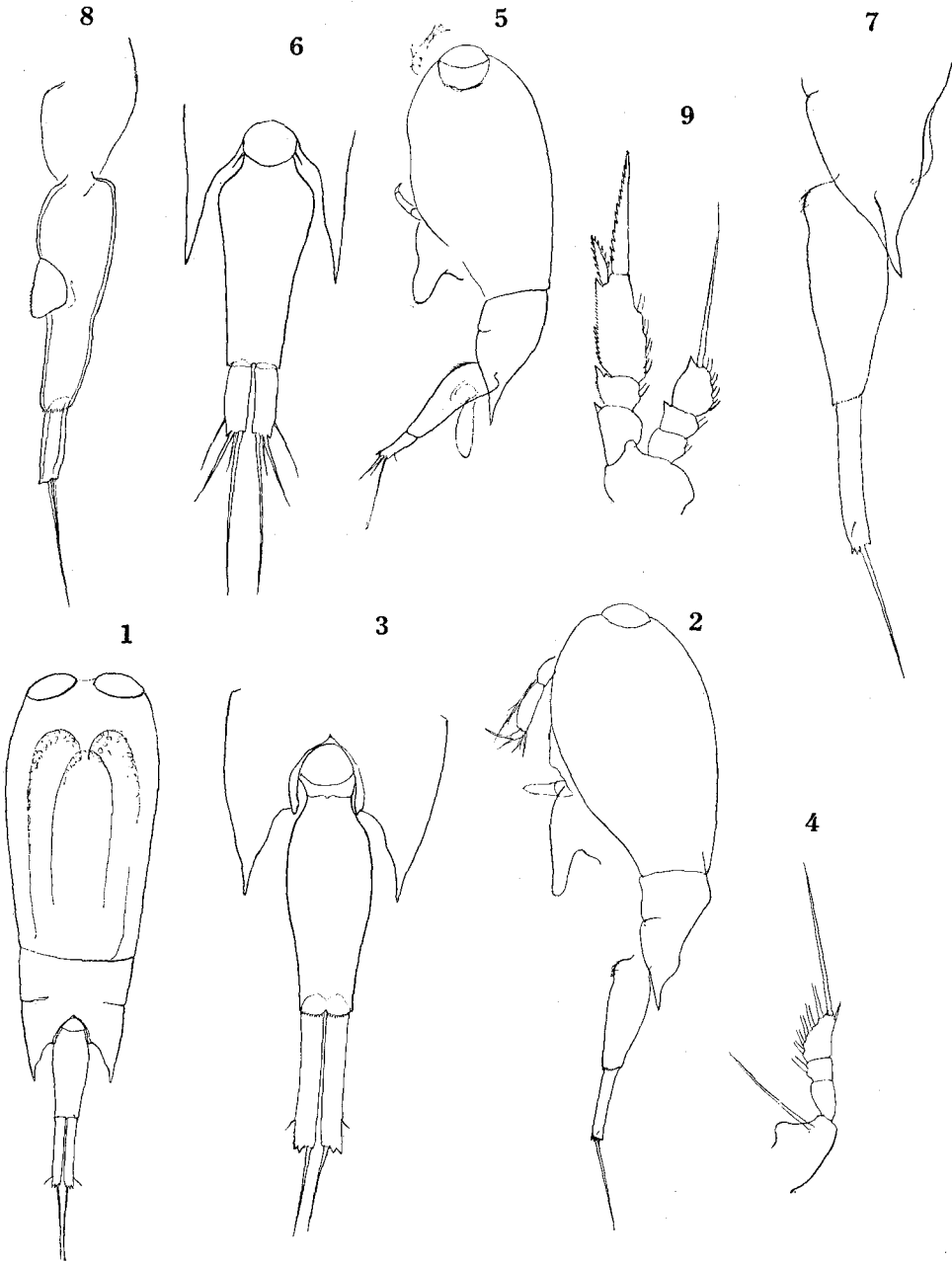
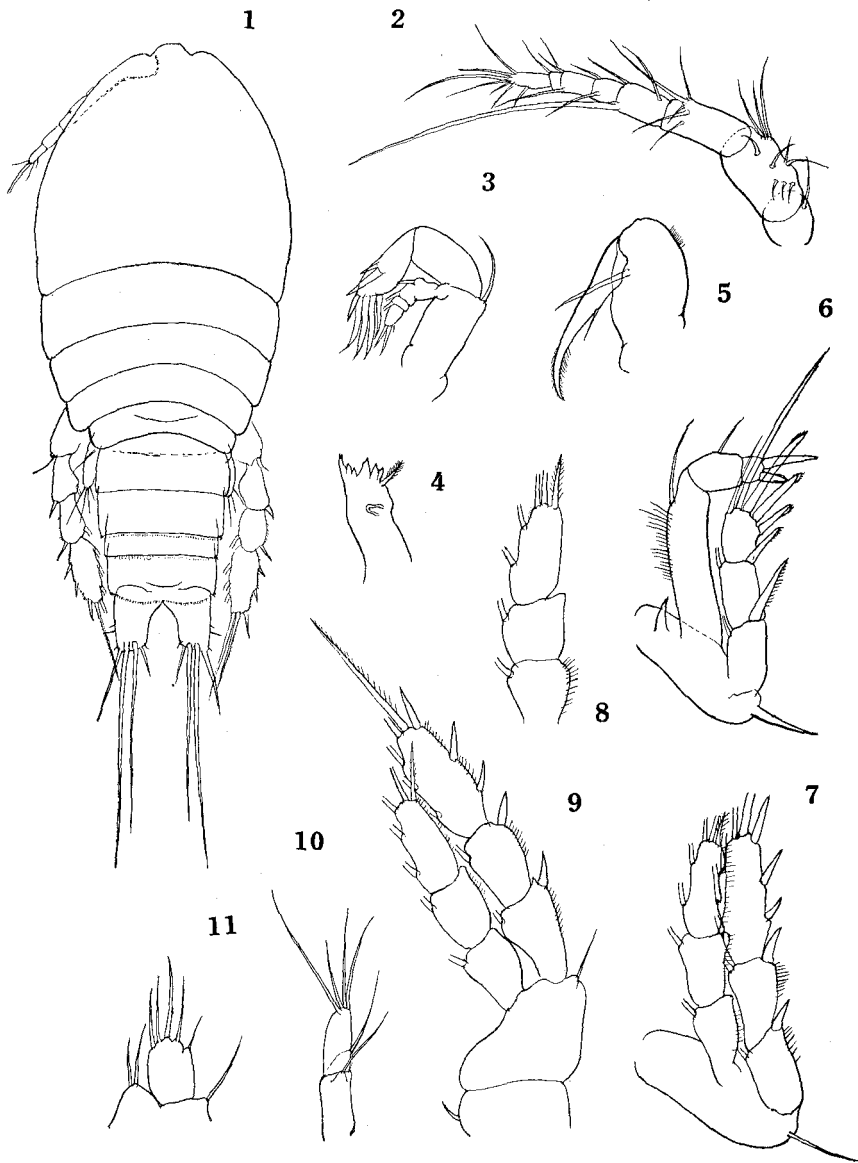


PLATE XL

Tisbe racovitzai GIESBRECHT (Figs. 1-11)

Female.

- Fig. 1. Dorsal view. $\times 133$
- Fig. 2. 1st antenna. $\times 267$
- Fig. 3. 2nd antenna. $\times 267$
- Fig. 4. Mandible blade. $\times 267$
- Fig. 5. 2nd maxilla. $\times 267$
- Fig. 6. 1st foot. $\times 267$
- Fig. 7. 2nd foot. $\times 267$
- Fig. 8. Endopod of 3rd foot. $\times 267$
- Fig. 9. 4th foot. $\times 267$
- Fig. 10. 5th foot, anterior view. $\times 267$
- Fig. 11. 5th foot, posterior view. $\times 267$



BIOLOGICAL RESULTS
OF
THE JAPANESE ANTARCTIC RESEARCH EXPEDITION

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